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Formal instruction in music today is primarily conducted in tonal idioms, although contemporary music tends to be atonal in nature. One of the reasons commonly given is that if fundamental instruction were given in atonal idiom only, the students would be handicapped in understanding serious music which is tonal in nature. To test the argument that atonal instruction will transfer to tonal idioms, a laboratory study was conducted. It examined the following issues. Will progress in the aural and visual perception of music through instruction based upon atonal organization transfer to progress in the aural and visual perception of tonal music? Will students of different levels of ability show similar attainment in the aural and visual perception of music under conditions of selected responses and constructed responses? Will students of different levels of musical ability respond with similar attitudes toward tape? Findings implied that musical instruction in atonal idioms is not detrimental to students, even with respect to tonal idioms. It also appeared that progress can be better measured when pure perception of intervals and melodies is not the crucial issue, and that tape-recorded self-instruction is an acceptable educational method both for high achieving and low achieving students. (AM)

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AURAL AND VISUAL PERCEPTION OF MELODY IN TONAL AND ATONAL MUSICAL ENVIRONMENTS

February 1967

U.S. DEPARTMENT OF
HEALTH, EDUCATION AND WELFARE

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AURAL AND VISUAL PERCEPTION OF MELODY IN TONAL AND ATONAL MUSICAL ENVIRONMENTS

Project No. 2413
Contract No. OE-4-10-177

Robert W. Sherman
Robert E. Hill, Jr.

February 1967

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Ball State University

Muncie, Indiana

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INTRODUCTION

Except for the limited amount of contemporary music performed at collegiate institutions and the even more limited number of graduate courses partially or entirely devoted to the music of our time, music education has not yet arrived at the twentieth century. An undergraduate curriculum incorporating course work in twentieth century techniques is indeed rare; and there are not too many curricula that deal with nineteenth century practice in any of the theory courses. This distant trailing of course content and pedagogical practice is rather unique to the field of music and is evidenced by the preoccupation of theorists and musicologists with the historical approach to doctoral studies.

In a recent study, Hornyak (10) gives evidence that comprehension of the stylistic developments of twentieth century music is within the grasp of even elementary school children and that,

> ...a more comprehensive methodology of music instruction, which would take into account the significant developments in music composition during the twentieth century, as well as those of earlier periods, is needed at all levels.

In the same study, Hornyak presents the following as the most revealing implication of his study:

> If one single idea is to be selected from the overall findings of the study, the researcher can quite readily determine that a lack of understanding of what the contemporary American composer is doing is an issue of paramount importance. Mere familiarity with the composer and his music does not lead to an acceptance of the composer's music. Aesthetic attitudes are developed in part as a result of the nature and extent of the auditor's understanding of the musical art. Therefore, if the listener is to accept the creative efforts of the contemporary American composer, he must understand what the

> composer is doing. This does not mean that understanding will automatically result in approval and acceptance. But it does suggest that an understanding of what the composer is doing will aid in the ultimate approval and acceptance of the efforts of the composer by his audience.

The development of pedagogical techniques in music have been gradual and have come about in response to changing objectives and social demands identified through studies of current instructional practices. Hendrickson (9) indicates that such surveys of current practices, while helpful in orienting a person in the field of music, contribute but little guidance relative to the directions in which music education ought to move. Research findings, on the other hand, contribute guidelines as to the type of approach to an educational experience which is best suited for teaching particular skills to particular students.

The potential of conducting controlled research has increased greatly with the development of programed instruction. Fattu (6) has noted that training devices and programed instruction really provide a tool for making rigorous methods studies. Music educators today may 1) ignore pedagogical problems and hope they will disappear, 2) view the problems in terms of what has been done historically, or 3) use proven media such as programed material in research studies to create and achieve an understanding of the "insistent" problems of instruction.

This research project is concerned with studying some related "insistent" pedagogical problems in the field of music theory. The specific problems which are to be studied are:

1) The abilities of students to develop and establish an aural and visual perception of melody organized by means other than tonality.*

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* In this study the term, perception, is used to denote not only the faculty of conscious awareness, but also the concept of knowing and comprehending that which is perceived.

2) The abilities of students to perceive intervals and melody within the complex of the environmental conditions of either tonal or atonal music having multiple voices rather than the historical approach of dealing with both intervals and melody in isolation.*

3) The abilities of students to develop an understanding of contemporary approaches to pitch organization and to demonstrate such understanding through composition without a prior study of eighteenth or nineteenth century techniques.**

Seagoe (17) concludes that transfer of learning is inherently dependent upon the effectiveness of the original learning and that positive transfer of learning is facilitated through the similarity of mode of presentation, context, meaning, and set in the learning and transfer situations. Implications from these conclusions would document the significance of research designed to utilize the harmonic and melodic techniques of twentieth century composition, and to provide a learning situation which simulates conditions of actual music.

Technical accomplishment in music during the present century has shown a rate of increase comparable to many of the sciences. As the years pass, the gap between the art and the school curriculum becomes increasingly large. Unless concerted efforts are made to create a music curriculum more independently couched in twentieth century aesthetics and related pedagogy, we will become a nation hopelessly untutored in the music of our own time. The effects of the aesthetic bias being cultivated by the curriculum overly oriented toward the historical may be partially documented by the relative impotence of foundation support for contemporary music and the inability of the contemporary composer to subsist on his creative efforts. The desired intent of individual or corporate subsidies will never be realized until music education steps wholly into the twentieth century and creates a public desirous of the artistic products of its own culture.

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* The original intent of giving training in both isolated and accompanied techniques was abandoned because it was discovered early in the year that the scope of the project was too great to allow the intended coverage of both. Also, the effective measurement of the learning abilities of students using the accompanied materials could not be accomplished if they were also using unaccompanied materials.

** This portion of the study is related to the nature of the classroom experience of half the students used in the study. No attempt was made to prove the existence of such understanding or to measure it in any way. The relationship of this study to the aural training is explained in the section designated method.

Should the investigation indicate that the development of aural and visual comprehension of melody in atonality can be successfully accomplished and that such instruction automatically results in a corresponding success in the aural and visual comprehension of tonal melody, it would open the door to a most needed up-dating of this and other areas of aural and visual training in music. Should it also be demonstrated that in the accompanying class work the student is able to comprehend and make effective use of contemporary composition techniques without the "benefit" of prior study in the techniques of tonal music, steps can be taken to realign the content of music theory courses with a view of moving the present content to a position of historical interest. This would make way for the use of contemporary practice as the primary "stuff" of which a basic theory course would be formed.

Within the total makeup of a tonal or atonal composition are elements of order that can serve as the bases of understanding which the student can utilize in the development of his aural comprehension of music. Within these same compositions are numerous elements of distraction which the student must learn to isolate and turn to his advantage. Research findings would indicate whether pedagogical techniques could be improved if intervals and melody were taught under conditions simulating the environment of actual music.

The major hypotheses underlying the investigation are:

1) Progress in the aural and visual perception of music through instruction based upon atonal organization will transfer to progress in the aural and visual perception of tonal music.

2) Students with different levels of musical ability will show equal attainment in the aural and visual perception of music under conditions of a) selected response-aural, b) selected response-visual, c) constructed response-written, and d) constructed response-vocal.

3) Students with different levels of musical ability will respond with similar attitudes toward tape-recorded self-instruction.

Another objective of the study will be to continue to collect and analyze data on a longitudinal basis for the purposes of 1) developing predictive criteria for success in undergraduate and graduate education in music and 2) periodic replication of design in order to study retention and forgetting rates of students taught through tape-recorded self-instructional techniques simulating actual music conditions.

The literature pertaining to the development of musical ability is composed primarily of reports of opinions, experiences, and recommendations based upon personal experience and/or the historical background of the field of music. Music educators seem to agree that music serves a unique function within the school program and that development of skill in music comprehension is essential for an individual's musical growth.

Much of the actual research literature has been focused upon eye movements (11), (23), span of vision (12), and tachistoscopic training with respect to span of perception (1), reproduction of rhythmic units (2) and reading of melodic material (22).

Weaver and Van Nuys (24) studied the relationship between the rhythmic and melodic (pitch) elements of music and ocular and manual behavior.

Research in the field of psychology related to the concepts of transfer and other aspects of learning form the conceptual framework for the problems of this research.

The application of the concepts of reinforcement in programed learning initiated and refined by Pressey (15), Skinner (18), Crowder (3), and others have led to limited research in music pedagogy. Spohn (20) found that the difference between an experimental group using tape-recorded self-presentation material and a traditional group was statistically significant at the one percent level in favor of the experimental group. Spohn, Poland, and Arnold (21) reported that students in music using tape-recorded self-presentation materials showed improvement which was statistically significant at the one percent level.

Spohn of Ohio State University recently compared the effectiveness of the aural self-presentation of intervals, rhythms, and tone groups using written and voice responses with the effectiveness of visual self-presentation of intervals, rhythms, and tone groups using written responses and voice responses.

Findings from a study of the "Development of Auditory Perception of Musical Sounds by Children in the First Six Grades" by Petzold (14) tended to support several hypotheses, among which was that the presence of rhythm does not influence the auditory perception of melodic (pitch) items.

Pace of the Music Department of Columbia Teachers College is studying the desired characteristics of laboratory equipment for music teaching, and is developing equipment and related programing for Electronic Teaching Laboratories (4).

Roe (16) compared the effects of a) teaching machines, programed textbooks, programed lectures, and a standard lecture, b) free response versus multiple choice, and c) individual booth versus classroom in mathematics. No statistically significant differences were found between students using the constructed response and multiple choice machines and the programed textbook with responses; but constructed answers required more time than multiple choice responses. Evans, Glaser, and Homme (5) report similar time results indicating that, on a comparison of constructed response and multiple choice response, both groups scored as well on the criterion test; but they caution against overgeneralizing from the series of experiments. Gotkin (8) quotes Silberman as pointing out that most criterion tests used for research in programed instruction have been short, hastily constructed tests, and cites contradicting results for retention obtained by Evans, Glaser, and Homme using different criterion tests. Gotkin further emphasizes the need for longer studies to compare the retention and transfer of material learned by students making overt responses as against students not making overt responses.

Roe (16) found that student attitudes towards the various teaching methods correlated neither with aptitude nor with performance on the criterion test. Reports of early trials with English 2600 programed materials suggested that brighter students have been bored with the program (8). Additional attitudinal studies should certainly contribute meaningful information to research studies in programed instruction.

METHOD

In order to conduct this study as free as possible of the influences of personalities and differences of teaching techniques, it was decided that all aural training be removed from the classroom. This meant that certain elements of aural training not included in the study would not be taught at all. We could not, of course, reverse the influential effects of the student's life-long familiarity with tonal music, nor could we control what the student played in ensembles or studied in other classes and applied music. We could, however, offer a uniform approach to formal aural training through the control of an electronic laboratory.

Among the many elements of design related to the functions of the laboratory and the selection of equipment, the following considerations were of paramount importance:

1) It was considered necessary that the sound produced through electronic means must be as good as live sound. If the sound were otherwise, the student's basic sensitivity to good sound would ultimately make the laboratory experience a painful one. Also, it could not be considered an advantage to study in a laboratory situation if the sound were distorted, lacking in quality, or unbalanced.

2) The reproducers and recorders used would have to be extremely rugged in construction and able to withstand the excessive abuse of constant stopping and starting eight to ten hours a day for several years with no more than nominal wear.

3) Student operation of equipment should be by remote control. Remote operation minimizes the responsibilities of the student in the general operation of equipment and lessens machine and tape damage.

4) Since the student's attention should be focused on the problem when heard and on providing an answer after hearing it, an automatic stopping

device would have to be used to free the student of all operating functions during these crucial moments. Because exercise and test tapes will number in the hundreds, the device would have to be tone-operated and not require any physical alteration of the tape.

5) The laboratory would have to provide the means for producing tests and exercise tapes and the facilities for multiple dubbing of these materials in addition to its basic function as a teaching device.

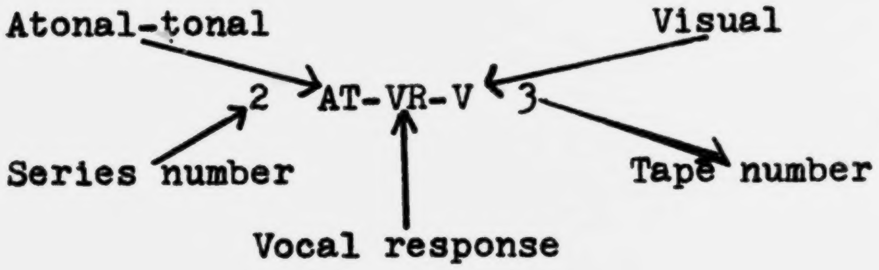
6) Some effective means would have to be provided to enable the student to give a vocal response to a problem and to examine his response and compare it with a correct answer.

7) An effective means of sound proofing the vocal response positions would have to be devised that would not require closed booths and consequently a ventilating system.

8) An effective bookkeeping arrangement would have to be devised to allow both students and instructors an instant view of the student's progress in the lab.

The music theory laboratory was finally established to accommodate fifteen students at ten listening positions and five vocal response positions. A floor plan, functional explanations and diagrams, and photographs of the laboratory may be found in the appendix. (A)

Each student was scheduled to work in the laboratory two hours per week. Upon entering the lab, the student asked the attendant for his personal log folder by referring to the color-code number. To assist the student attendants in proper handling and indexing, the log folders, tapes, and tape containers were color coded. The colors red, gold, green, and blue were used respectively for class section one, atonal; section two, atonal-tonal; section three, tonal; and section four, tonal-atonal. The log folders contained the student's log sheet upon which he recorded the number and dates of tests and exercises completed, and the number and types of errors made. All exercise and test papers were also kept in the folder. After receiving his folder, the student consulted the bulletin board upon which was listed the tape codes and contents of all exercises and tests. After selecting the particular tape desired, the student indicated his choice to the attendant who then prepared the tape machine and gave the student the proper answer sheet or vocal response form. All tapes were referred to by code rather than contents or description. An example of such a tape code would be:



The tape recorded materials used in the laboratory consisted of approximately 300 different exercises and tests: 75 for each of the four instructional groups. The tapes had a running time of either fifteen or thirty minutes. There were ten copies of the first few tapes in each response category and five copies of all others.

Before presenting intervals and melody, a number of tone matching exercises and tests were devised requiring either a selected response-aural or a constructed response-vocal.

The intervals were presented in order: 2nds, 3rds. . . 7ths, 8ths. Each interval class, when first introduced, was presented alone in settings of one other voice, two other voices, and then four other voices. Next, the interval class was combined with the intervals that preceded it in the order of presentations; i.e., the m3 and M3 when first presented were presented alone with the various types of accompaniment followed by the m3 and M3 combined with the m2 and M2. After this, the intervals, along with those previously presented, were used in melodies having 3 - 4 notes and accompanied by one other voice, two other voices, and four other voices; and then in melodies having 5 - 7 notes and accompanied by one, two and four other voices.

Each of the gradations in the presentation was treated in exercises calling for each of the four types of responses: 1) selected response-aural, 2) selected response-visual, 3) constructed response-written, and 4) constructed response-vocal. Students were advised to use all four types of responses when dealing with any one interval or melody before moving on to the next. They were also advised to begin each group with the selected response tapes first. However, the students were free to use the materials in whatever way they wished, and they were also free to repeat tapes when scores were low and to backtrack for review whenever they felt the need.

Once each quarter, instructor-corrected tests were given; all other tests were corrected by the student. During tests, the machines were adjusted to lock-out the repeat mechanism to prevent the repetition of problems.

Early in the deliberations concerning the content of the pre-test, it was necessary to clarify the particular meaning which the terms "tonal" and "atonal" were to have in relation to this study. It appeared necessary at the outset to adopt a rather narrow definition of each term since the distinctions to be made in the study had to be clearly drawn and not subject to the "greying" effect of using music considered "sort of tonal" by one person and "sort of atonal" by another. The word "tonal," clearly regarded here as the adjective form of the word "tonality" rather than a term denoting a different sort of tone centeredness than tonality refers to only that music in which a referential tone is established by means of a tonic-dominant relationship. Examples composed for the pre-test, being necessarily brief, were so composed as to be characteristic of any intelligible fragment of music extracted from the literature. Any relationship considered appropriate to the structure of tonality was regarded as appropriate for use in this study. "Atonal" is herein regarded as referring to only that music in which pitch is organized by means other than those associated with the idea of tone centeredness, A variety of means was used from the free use of twelve tones to serialism. In spite of the care taken, a few problems did appear in which the pitch organization was ambiguous in regard to the qualities of tonality and atonality. The brevity of the problem items contributed most to this occasional lack of clarity.

Out of consideration for the problems of statistical analysis and the hope of being able to answer questions not directly the intent of the investigation, it was decided to give blanket coverage of the intervals by using all the intervals in ascending and descending form and in three pitch ranges. All of this within both tonal and atonal organization combined with the factor of the difficulty scale necessitated the composition of 144 problems utilizing isolated intervals only and 432 problems utilizing intervals accompanied by one, two, and four other voices. Since each problem contained three separate items, each of which was often relatively independent as a musical idea, the number of accompanied musical examples composed for interval testing was 1296. A sample of the kind of treatment given intervals may be found in the appendix; the ascending and descending major seventh interval is used in both types of pitch organization and in all three pitch ranges with one, two, and four voice accompaniments. (B)

The coverage for melody was less exhaustive but still adequate for statistical analysis. As the work progressed in the composition of these, it became quite apparent that our original intent of dealing with melodies having as many as nine or more notes would be unnecessarily difficult and would have produced a test of questionable reliability. The number of notes used was limited, therefore, to seven and the melodies were placed into two groups containing 3 - 4 and 5 - 7 notes respectively. These problems were considerably longer than those dealing with intervals; in some cases, there were as many as twelve to sixteen measures of music. The tests concerning melody required the composition of 360 musical examples which were used to make 120 selected response problems. Samples of melodies having three, four, five, six and seven notes in both the relatively high and low pitch ranges and accompanied by one, two, and four other voices may be found in the appendix. (C) The examples are about equally divided in regard to tonal and atonal organization.

Four types of responses were used in the test: 1) selected response-aural, 2) selected response-visual, 3) constructed response-written, and 4) constructed response-vocal. Sample test forms used in the pre-test may be found in the appendix. (D) Within each of the response categories there were varying degrees of difficulty based on the distraction and coloration of accompanying voices as well as the relatively greater difficulty of melodies compared to intervals. The nine degrees of the difficulty scale, moving from the simple to the complex, would be as follows:

1) the interval with one other voice
2) the interval with two other voices
3) the interval with four other voices
4) the 3-4 note melody with one other voice
5) the 3-4 note melody with two other voices
6) the 3-4 note melody with four other voices
7) the 5-7 note melody with one other voice
8) the 5-7 note melody with two other voices
9) the 5-7 note melody with four other voices

Within each of these nine degrees, a few of the problems were found to be somewhat more or less difficult than intended because of the varying degrees of complexity, type of instruments used and the clarity of these in the recordings, and (in the selected response-aural tests) because of the response positions. These occasional discrepancies did not substantially alter the over-all effect of the difficulty scale.

Indices of difficulty and discrimination for each item of each test in the selected response category may be found in the appendix. (H) The proportion of correct responses achieved in each response position (1, 2, or 3) for tests one through five, inclusive, may be found in the appendix. (I) The proportion of correct responses achieved in each pitch range (high, medium, low) for tests one, two, and three may be found in the appendix. (J)

The pre-test when completed contained fourteen tests of varying length and required nine 50-minute class periods to administer. A complete description of the pre-test along with a concise outline of its content may be found in the appendix. (F) (G)

During the year prior to the administration of the pre-test, arrangements were made with those in charge of registration to reserve the 8:00 and 2:00 hours of all students registered for first year music theory. During the first full week of school, each student appeared two hours daily for testing. The first hour was used to administer the Seashore and Aliferis tests; the remaiming nine hours were used for the pre-test. The tests were all given in a small auditorium in which the acoustics could be considered better than adequate for the purpose. Even though the uniqueness of the experience generally kept the students alert and interested, two 50-minute periods a day of problems appearing with insistent regularity was extremely wearing and continuous concentration was very difficult.

The administration of the post-test required a change in both the time and place. The last nine days of class were used with sections one and two taking the test at the 8:00 hour and sections three and four at the 2:00 hour. Since the hall used for the pre-test was in the process of being converted to a stacks area for the library, a different and less desirable location had to be used. The room was small for the purpose and did not offer the degree of isolation from outside disturbance offered by the hall used for the pre-test. Having finished a year's work using earphones, the students were quick to point out that the sound in the room was far less clear than the sound they had become accustomed to by using earphones.

After the administration of the test in the fall of the experimental year, data relevant to the technical aspects of the performance of the test were gathered and analyzed. Means and standard deviations of the various tests are as follows:

Test No.	Mean	Standard Deviation	Test No.	Mean	Standard Deviation
1	103.09	14.73	8	20.76	7.47
2	91.47	16.34	9	9.75	3.26
3	78.07	16.86	10	9.36	3.03
4	27.35	6.50	11	12.94	8.93
5	23.04	4.71	12	12.98	8.52
6	22.60	7.07	13	57.82	16.41
7	22.72	7.29	14	10.64	7.33

The reliabilities of the various tests were computed using the generally accepted split-halves approach and the Spearman-Brown Prophecy Formula. Results are as follows:

Test No.	Reliability	Test No.	Reliability
1	.854	8	.822
2	.908	9	.631
3	.906	10	.612
4	.664	11	.906
5	.434	12	.843
6	.804	13	.906
7	.812	14	.895

Each test was item analyzed in accordance with generally accepted techniques, an example of which can be found in Chapter 11 of the book, Measuring Educational Achievement, Dr. Robert L. Ebel, published by Prentice-Hall and copyrighted 1965. The difficulty index of each item was calculated. This difficulty index is essentially an inverse index which indicates the ease rather than the difficulty of the item; i.e., the index specifies the proportion of students responding successfully to the item. Thus, a relatively high difficulty index in reality implies a relatively easy item.

The discriminating power of each item was also calculated, using the Upper-Lower Index as recommended by A. Pemberton Johnson in his article "Notes on a Suggested Index of Item Validity: The U-L Index, "Journal of Educational Psychology, Vol. 62, 1951, pp. 499-504. As a matter of general information, it may be noted that discrimination refers to the power of an item to separate high achievers from low achievers. If, for example, an item had a discrimination index of zero, this would mean that the better students were not separated whatsoever from the poorer students by this particular item. On the other hand, if a particular item had a discrimination index of one, this would mean that it functioned perfectly in separating the higher achievers from the lower achievers.

As has been previously noted, a complete list of the difficulty and discrimination indices of each item in each test of the selected response category will be found in appendix (H). Tests in the constructed response category are not amenable to this type of item analysis. The issue of what constitutes ideal difficulty and discrimination for items is open to question. There are differences of opinion among experts in the area of tests and measurements. These stem from various points of view and vary according to the purpose of the test. The point of view held in this report is that item difficulty should be near the middle of the difficulty range. There is no way of establishing rigorous optimum upper and lower limits in the middle difficulty range. However, it is suggested that a lower limit be thought to exist around .35 to .40, and an upper limit be thought to exist around .70 to .75. Items whose difficulty is within this range are regarded in this project as entirely satisfactory from the standpoint of difficulty.

A similar situation exists with regard to discrimination. However, most experts would recommend that the discrimination index be as high as possible, the limiting value being 1.00. The basic issue, therefore, becomes one of establishing the lower limits of acceptability with regard to discriminating power. The following guides are arbitrarily established for this project: Items whose discrimination indices are .40 or higher are functioning exceptionally well. Items whose indices are between .20 and .40 are functioning satisfactorily. Items whose discrimination indices are lower than .20 may be regarded as adding very little to the over-all discriminating ability of the entire test. It should be noted that it is possible for the index of discrimination to drop through the zero point into negative values. In this case, the item is correctly answered more frequently by low achieving students than by high achieving students. Obviously, such an item is working contrary to the goal of the test. Persons with limited experience in the area of tests and measurements might easily conclude that the occurence of negatively discriminating items would be extremely unusual. Unfortunately, that is not the case. That is, it is by no means rare to have some negatively discriminating items occur within a total test.

During the pilot year, academic 1964-65, it was found that the electronic installation required would consume substantially more time than was originally anticipated. In addition to the creation of the test during this pilot year, the students who had been enrolled in the previous year, and whose grades had already been issued in the music theory course, were used as a sample for developing a predictive equation for course grades. Multiple regression was performed employing various tests routinely administered at the beginning of the year as predictors of the grade ultimately received in the course. Unfortunately, the predictive equation thus calculated was invalidated due to a change in the routine entrance testing program at Ball State University. It was therefore necessary to recalculate the multiple regression, using personnel from the pilot year to obtain the predictive equation employed for the students during the experimental year.

There were ten variables (test scores) available for use in the multiple regression. They are listed as follows, each with its coefficient (weight in raw score form):

*1. Seashore Pitch: -.011816
2. Seashore Rhythm: .070234
3. Seashore Tonal Memory: .010205
**4. Aliferis Melody: .055401
5. Aliferis Harmony: -.043431
6. Aliferis Rhythm: -.020822
***7. Scholastic Aptitude Test (SAT) Verbal: .001950
8. Scholastic Aptitude Test (SAT) Numerical: .001209
****9. Purdue English (Reading and Vocabulary): .000817
10. Purdue English (Language Usage and Spelling): -.003792
11. Constant: -.704655

The multiple R was .42. None of the variables attained statistical significance at the .05 level. This multiple R was regarded as disappointingly low, and implied that the musical abilities under investigation were not very precisely predictable from the entrance test scores available. The relatively low predictive power of the multiple R was checked at the close of the experimental year by performing simple Pearson zero-order correlations between the predicted grade and the grade earned in the fall quarter in the first instance, between the predicted grade and the average of the fall and winter grades in the second instance, and between the predicted grade and the average grade for the entire academic year. Results are as follow: Predicted grade and fall quarter grade, $r = .396$. Predicted grade and average grade for the entire academic year, $r = .402$. These are of the same general order of magnitude as the multiple R.

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* Seashore Measures of Musical Talent, Series B, Psychological Corporation, 1956

** Aliferis Music Achievement Test, College Entrance Level, University of Minnesota Press, 1954

*** Form currently used in national program

**** Purdue English Achievement Test, Form E. Boston: Houghton-Mifflin, 1955

The entrance test scores of each student in the entire sample were inserted in the predictive equation to obtain a predicted final course grade for the student in question. The entire sample of students was then ranked in order of the predicted grades. Beginning with the highest predicted grade and continuing downward, each student was arbitrarily assigned to one of the four instructional groups. There were occasional circumstances which required that a particular student be placed in a particular section of the course. However, for the most part this method of assigning students to sections resulted in a "balance" among the four sections with respect to predicted grade. The procedure may be regarded as a quasi-randomization rather than a true randomization, since attention was paid to the possibility of a chance sequence of assignments of several students with sequentially adjacent predicted grades into the same class section. Also, all students were given a brief questionnaire prior to the organization of the sections, in which they were asked about three matters in particular: 1) their feeling toward tonal and atonal music; that is, whether they had strong biases for or against either; 2) their willingness to participate in this experimental endeavor; and 3) their degree of certainty as to whether they would remain in the music program generally, and the experimental investigation particularly. Responses to these questions were also kept in mind when constituting the four instructional groups. Again, the goal was to "balance" the four groups, and avoid any systematic bias.

The students in the experimental sections were given the pre-test at the beginning of the academic year 1965-66, and were given the post-test at the end of that same academic year. The test involved was a single instrument, and the label pre implies the fall administration, whereas the label post implies the spring administration. Each test was scored in three ways: First, the number of tonal items correct, second, the number of atonal items correct; and third, the total number of items correct.

The four instructional groups made from the 100 entering students selected for the experimental population were arranged into two basic lecture groups. Lecture group A, composed of sections one and two, was given class instruction in the materials and aesthetics necessary to a fundamental understanding of several pitch organizing techniques and other formalizing elements employed in the composition of contemporary music. Section one was assigned to the study of only tonal exercises in the laboratory, and section two was assigned to the study of atonal-tonal exercises.

Lecture group B, composed of sections three and four, was given class instruction in the materials and practices necessary to a fundamental understanding of the compositional techniques employed in tonal music. Section three was assigned to the study of only tonal exercises in the laboratory, and section four was assigned to the study of tonal-atonal exercises. Within each of the four classifications of laboratory study, tapes devoted to the same type of material were always made of the same number of equally difficult problems; therefore, students assigned to either of the mixed groups were not required to do more or less than those assigned to either tonal or atonal study.

All sections encountered exercises calling for a) selected response to an aural stimulus, b) selected response to a visual stimulus, c) constructed-written response to an aural stimulus, and d) constructed-vocal response to a visual stimulus. Sample exercise forms used (for laboratory study) may be found in the appendix. (E)

The class instruction for both lecture groups, except for the absence of aural training, followed our customary practice of using analysis as a means of having the student observe the use of materials in existing literature, and free composition as a means of having students experience the process of creativity. Students were assisted in the development and cultivation of a personal style of writing.

The course began with a comprehensive study of melody. Through analysis and composition, students learned to utilize the concepts of melodic transformation, pitch and rhythmic organization, and other formalizing elements broadly applicable to the particular idiom in which the students were writing. From this point on, the materials and formalizing principles necessary to multiple voice writing were added as the assignments became longer and more complex. All assignments in composition, no matter how small, were designed to be complete and expressive musical shapes. All compositions were written for: some instrumental group available in the class, solo piano, solo instrument with piano, or voice with piano. On occasions, some of the compositions were performed on student recitals as a tribute to their high quality. By the close of the year, students were expected to be able to compose short instrumental pieces for as many as five instruments.

Students in lecture group A gained experience in the rudimentary but effective utilization of such organizational techniques as: 1) the connecting of alternating m2 and M2, 2) melodic shaping restricted to prescribed intervals, 3) the use of isometric scales, 4) the projection of intervals, 5) the geometric treatment of horizontal and vertical shapes, and 6) serialism. A typical example of one of the better compositions written by one of the students from lecture group A is included in the appendix. (L)

The first major hypothesis under investigation in this study concerned the question of aural and visual perception of music, and the possibility of transfer in such perception between music couched in tonal and atonal idioms. For this portion of the investigation, data from each test were submitted to an analysis of covariance. The four experimental sections served as four treatment groups. There were in actuality three analyses of covariance for each test: for tonal setting, for atonal setting, and total. In each analysis of covariance, the pre-test score served as the covariate, and the post-test score served as the criterion.

Since an analysis of covariance was possible only with students who completed the course and took both the pre-test and the post-test, it was clear that a certain amount of student attrition would occur. This, in turn, would result in the loss of degrees of freedom for analysis purposes. Therefore, as a matter of interest, all data were subjected to a simple analysis of variance involving nine separate settings for each test as follows: 1) pre-test tonal; 2) pre-test atonal; 3) pre-test total; 4) post-test tonal; 5) post-test atonal; 6) post-test total; 7) change tonal; 8) change atonal; 9) change total. Change data refer to difference scores obtained for each individual by subtracting his pre-test score from his post-test score. This entire analysis should be considered of subsidiary interest, since the analysis of such change data may be regarded as having a lower precision than the analysis of covariance. (7) See appendices. (O) (P)

The second hypothesis was partially concerned with the question of measurement accuracy which could be obtained under varying response conditions; namely, selected and constructed. Within the category of constructed responses, there were two sub-categories; namely, written and vocal. The question of measurement accuracy was investigated by analyzing the reliability of each individual test and each group of tests which fell together within one of the previously named categories. Specifically, one category of selected response involved aural stimuli. This was comprised of tests one through five and test thirteen. A second category of selected response involved visual stimuli. This consisted of tests six through ten. One category of constructed response consisted of tests eleven and twelve, in which the task of the student was to write on a musical staff the correct single pitch or sequence of pitches involved in the problem. The second category within the constructed response type was that in which the response was vocally produced by the student. In this instance, there was a single test, number fourteen. Using the system recommended by Snedcor, the tests were grouped into their respective categories. (19) The Fisher z transformation was used to combine and average the reliabilities for the various tests within the sections. The chi square statistic was used to test the hypothesis that the various reliability coefficients may be presumed to have come from the same basic parent or common population of reliability coefficients. This approach also made it possible to estimate an average reliability for the four groups (stimulus-response conditions) of reliabilities.

The second hypothesis was also concerned with a comparison of learning progress of higher and lower achieving students as measured by the various response categories. To investigate this, the entire group of students was ranked in order of grade or mark received in the course. The ranked group was divided at the midpoint, thus constituting two contrasting grade groups, a high and a low. Means of change data were calculated for each grade group for each test.

These were organized into the four response categories, and arithmetic averages were calculated for these groups of means. Also, ratios were formed between the arithmetic averages of group means (change data) and the total score possible combining all tests within a response category. Data thus obtained indicate whether progress (change) occurs similarly between high and low achieving students among response categories.

The third major hypothesis of this investigation concerned the question of attitudes toward self-instruction in a laboratory setting which would be held by those who were high achievers in the music area in contrast to those who were low achievers in the music area. The approach used here was that outlined by Osgood, and commonly known as the Semantic Differential. (13) Using pairs of bi-polar adjectives suggested in the Osgood text, a pilot form of the attitude instrument was designed. This originally contained 30 bi-polar adjective pairs which were administered to the pilot group in the experimental form. The favorable direction of the seven category response continuum created by the hi-polar adjectives was randomly determined; i.e., certain items contained the favorable response at the left end, others at the right end, and such variations were random.

The pilot group consisted of one section, that is, approximately 30 sophomore music theory students. Beyond the 30 experimental bi-polar adjective pairs or semantic differentials, a 31st variable was generated which served as the criterion against which the various semantic differentials were compared. This criterion variable was the arithmetic average of all 30 semantic differentials or bi-polar adjective pairs for one stimulus word or phrase; i.e., the criterion variable was the arithmetic average or mean for all people in the pilot group. The scoring for each stimulus word or phrase was accomplished by awarding one point for the least favorable position for each semantic differential, two points for the next least favorable position, and so on to the granting of seven points for the most favorable position. The mean was calculated by summing all scores and dividing by the number of semantic differentials involved, which was 30 in the case of the experimental form.

A zero-order Pearson product-moment correlation coefficient matrix was generated, comparing each semantic differential result with each other semantic differential result for each stimulus word or phrase. The correlation matrix was employed in a step-wise multiple regression in which the least contributor was removed sequentially. A similar process was employed in generating a zero-order correlation matrix of the bi-polar adjective pairs, or semantic differentials with the criterion variables. For ease in comparing and combining the correlation between the bi-polar adjective pairs and the criterion, the correlations were changed into their equivalent Fisher z transformations. By visual inspection, those correlating most highly with the criterion were noted. In conjunction with the multiple regression, it was found that fifteen bi-polar adjective phrases, or semantic differentials, would yield a multiple R larger than .99. Since fifteen would fit comfortably on a single double spaced typewritten page and also leave room for the stimulus word or phrase, it was decided to use the fifteen most effective as determined above. Because of a typing error, one of the bi-polar adjective pairs was invalidated; however, the fourteen remaining would without question still yield a multiple correlation very close to .99. Thus, it is contended that the inadvertent loss of one of the fifteen bi-polar adjective pairs did not appreciably reduce the effectiveness of this attitude measurement.

The final form of the attitude instrument was administered to the four sections near the close of the experimental year. A copy of this may be found in the appendix. (M) The results were scored as previously described, and the fourteen numerical values for a given stimulus word or phrase were summed for each student. The entire group of students was ranked in order of grade or mark received in the course. The ranked group was divided at the midpoint of the grade distribution, thus constituting two contrasting grade groups, a high and a low. The scores of the students in the two contrasting groups were then analyzed by means of Student's t test for small independent samples. The hypothesis under investigation was the null hypothesis with respect to the difference between the means of the two groups. That is, it was hypothesized that there would be no statistically significant difference between the degree of favorable attitude expression on the parts of the high and low grade groups.

The establishment of an appropriate level for statistical significance is in itself not a statistical problem. Rather, the consideration revolves around the relative consequences of a Type I or a Type II error. A Type I error is the rejection of a null hypothesis which is in fact true, and a Type II error is the retention of a null hypothesis which in fact is false. In this investigation, if the hypothesis were in fact true but were to be rejected, this would imply an advantage either for tonal or atonal musical instruction, which would be fallacious. If the null hypothesis were in fact false, but erroneously retained, then the true advantage of either the tonal or atonal setting would be masked. A further consideration was the limited amount of research done in this area. Generally speaking, statistically significant findings tend to discourage further research, whereas lack of statistically significant results tends to encourage further probing in the areas under investigation. With these considerations in mind it was deemed appropriate that the .01 level be used for claiming statistically significant findings.

RESULTS

The factual results relating to the first hypothesis were obtained by means of a series of analyses of covariance. The details of these analyses are contained in the Appendix. (O) There were three analyses of covariance performed for each of the fourteen tests involved. In each case, covariance analysis was performed on scores resulting from: 1) tonal items, 2) atonal items, and 3) total items. Only one of the total of 42 analyses of covariance resulted in statistical significance at the .01 level. That analysis involved only the atonal items in test number fourteen which called for a vocally produced response.

Factual results concerning the second hypothesis came partially from the reliability analysis of the fourteen tests and partially from the arithmetic averages of groups of means of change data for contrasting grade groups within response categories. Regarding the former, the total test was divided into four categories as follows: 1) selected response-aural, 2) selected response-visual, 3) constructed response-written, and 4) constructed response-vocal.

For selected response-aural, there were a total of six tests, numbered one, two, three, four, five, and thirteen. The chi square value which resulted from an investigation of the hypothesis that all six test reliabilities may be presumed to have come from the same parent or common reliability, resulted in a value so large that this hypothesis had to be rejected. A visual inspection of the data indicated the likelihood that the rejection of the hypothesis was caused by tests four and five which were the most difficult and least reliable within this category. The data were analyzed again excluding tests four and five; that is, employing only tests one, two, three, and thirteen. In this case, the resulting chi square indicated that the hypothesis of a common reliability could well be retained, and the estimate of average reliability was .896.

The selected response-visual tests were analyzed in the same way. This category consisted of tests six, seven, eight, nine, and ten. When all five tests were combined, the resulting chi square indicated rejection of the hypothesis of a common reliability. As in the preceding case, there were two tests which were notably more difficult and less reliable than the other three. The data were therefore analyzed again using only tests six, seven, and eight; tests nine and ten being more difficult and less reliable. In the second analysis the chi square value obtained indicated that the hypothesis of a common reliability could well be retained, and the estimate of average reliability was .813.

There were two tests in the category constructed response-written. These were tests eleven and twelve. A similar chi square analysis was performed on these two tests, and the resulting value indicated that the hypothesis of a common reliability could well be retained. The average reliability was estimated as .878.

The fourth category of constructed response-vocal consisted of a single test which was test fourteen. In this case, naturally, no analysis of combined tests was possible. The reliability for test fourteen was .895.

Following the analysis by response category, all tests were combined in a similar analysis. In this instance, the resulting chi square indicated rejection of the hypothesis of a common reliability. (See Appendix K)

Hypothesis two was also investigated by dividing the entire group of students at the close of the experimental year into a high grade group and a low grade group. Mean values were calculated for each group for each of the fourteen tests. The mean values thus calculated were divided into the four types of response conditions: selected response-aural, selected response-visual, constructed response-written, and constructed response-vocal. As explained above, the first response category consisted of six tests. The means of the high and low grade groups were themselves averaged, thus giving an arithmetic average of the means of change data for the total test. A similar procedure was followed with regard to the second response category in which there were five tests combined. The third response category consisted of two tests which were similarly averaged, and the fourth response category consisted of a single test. The table of results may be found in the Appendix. (Q)

DISCUSSION

The results with respect to the first hypothesis seem to be remarkably consistent. There were three analyses of covariance for each of the fourteen tests, making a total of 42 such analyses. Of these, only one analysis reached statistical significance at the .01 level. This single analysis was for atonal items on test number fourteen, which required the vocally produced response. Thus, the weight of evidence seems to indicate that the null hypothesis is in fact true with respect to the transfer between tonal and atonal musical organization when instruction is carried out as was done in this project. The single statistically significant finding would seem to be relatively inconsequential, since the question might legitimately be raised whether this particular result was not in fact a chance occurrence.

Though nothing of statistical significance may be claimed concerning the first hypothesis beyond the fact that transfer of learning operated in both directions, some interesting "tendencies" appeared which should not be ignored. (See Appendix (N)) An examination of the post-test performance of class section two (atonal-tonal), for example, indicates a consistent improvement in the position of this section in relation to its pre-test superiority. This gain in superiority is pointed up by an equally dramatic rate of improvement reported in the change data. The basic superiority of section two in this particular area of theory training, it should be pointed out, was a chance happening since none of the procedures used in sectioning would tend to favor this or any of the four sections.

The improved superiority of section two was balanced by a corresponding decline in the superiority of section three (tonal). Section three is shown to have made the least amount of improvement in both tonal and atonal parts of the post-test. Sections one and four, which were evenly matched in the pre-test with section one being a fraction superior to four, were still rather close in the post-test with section four being slightly superior to section one. The amount of change in these two sections was rather close also with section one showing slightly more change in the total test than section four. The consistency and strength of these tendencies, which favor somewhat the effect of atonal organization, might serve to supplement the statistical findings regarding the first hypothesis.

With regard to the second hypothesis, it appears that, in general, the tests as produced in this project may be regarded as satisfactorily reliable. When the two most difficult tests were removed from the two selected response categories, all reliabilities, when averaged for response categories, exceeded .80. In fact, three of the four response categories had average reliabilities approaching .90. Thus it would appear that if the precaution were taken of avoiding too difficult a test, progress in musical attainment of the type under investigation here could be measured with about the same degree of accuracy using any one of the four types of response categories. It is probable that the measuring accuracy of the more difficult tests (four, five, nine, and ten) could have been improved had the students been allowed to hear each problem again. A limitation which has been previously mentioned might be repeated, namely, the average reliabilities calculated for the selected response categories stem from a combination of five and four tests respectively. In contrast to this, the reliabilities obtained for the two constructed response categories stem from a single test in one case, and a combination of two tests in the other.

The evidence does not appear to support the hypothesis that students with different levels of musical ability will show equal attainment under either selected or constructed response conditions. In both instances of constructed response, the degree of improvement shown was substantially greater than that which occurred in each of the two selected response categories. In addition, the magnitude of progress appears greater in the area of constructed responses than it does in the area of selected responses, particularly when seen as a ratio of mean improvement to total score possible. (See Appendix (Q)) An interesting result occurred in the area of selected response-aural. Here the magnitude of the arithmetic average of the means for all six tests was greater for the low grade group than for the high grade group. Upon considering the nature of the stimulus and response employed in this category, it may be speculated that success here is more a matter of pure perceptive skill than would be so in the case of any of the other three response categories in which learning probably plays a more crucial part. If this is so, it would imply that progress in learining _per se_ is less amenable to measurement with this stimulus and response category so long as perception is the basic attribute being measured.

The factual results relating to the third hypothesis also seem to be remarkably consistent. For each of the stimulus words or phrases employed, the attitudes expressed by the high grade group and the low grade group did not differ significantly at the .01 level. Therefore, it seems legitimate to conclude that students with different levels of musical ability do possess similar attitudes toward tape-recorded self-instruction of the sort used in this research project.

One of the most interesting happenings to be observed during the study was the relative ease with which students assimilated the spirit and techniques of twentieth century music and were able to give expression to their understanding through free composition. Relating the general success of these students to those in the recent past who customarily learned to use the contemporary idioms only after at least a year's study in the techniques of tonality, the group not having previous training in tonality appeared to be less inhibited, generally able to exercise more originality, and were also far more consistent stylistically. The atonally trained group was more inclined to look upon their efforts as "music" than did first year students who were tonally trained.

The past year's experience has also left the atonally trained group relatively "unafraid" of new music, but no less critical in their judgement. At no time did any of the students exhibit a blind acceptance or rejection of any of the techniques studied. Individual students expressed preferences for certain of the techniques and produced a quality of work to support these preferences. Individual students also showed strong and consistent tendencies to be relatively conservative or radical in their approaches to individual style. Throughout the year, a rather healthy tolerance was developed toward the various techniques studied, and individual likes and dislikes in music were directed more justly toward specific pieces of music rather than toward particular techniques of composition. In other words, students were far less inclined to confuse personal style or success in a piece of music with the general technique employed in its composition.

During the first quarter of the 1966-67 academic year, twenty of the students from the previous year's atonally trained group were given instruction in the use of tonal materials. They were able to assimilate the material quickly and use it in a more imaginative and often quaint way, with a good feel for the independence of line within harmonically controlled music, and with a far more sophisticated sense of harmony and texture than students of recent years who had studied for the same amount of time but whose study was limited to the concepts of tonality. An interesting outcome of this particular sequence of study; i.e., a year's study in atonality followed by the one quarter of tonality, was the verbally expressed desire of the great majority of the class to be done with tonality and to return to further study and composition in contemporary idioms. Their manner of expressing this attitude did not appear to be the result of a developed dislike or even disinterest in tonal music but rather an expression of the point of view that their technical training (insofar as it has to do with the selection, comprehension, and use of valid materials and techniques of composition) should center on what is relevant to the age in which they live.

CONCLUSION

Concerning the first hypothesis, the major conclusion to be drawn from the analyses of covariance is that the four instructional groups may be said to have come from the same population and that transfer of learning, in the area of auditory training investigated, did in fact take place. Supplementary evidence of a non-statistical nature concerning the direction of transfer tended to favor the effect of atonal study.

The reliability of the pre-test/post-test proved to be respectably high in general. Regarding tests number four, five, nine, and ten, one might easily conclude that the lower reliability was due to the excessive difficulty resulting from not allowing the students enough time to observe and solve the more complex problems rather than an inherent flaw in the concept or format of the problems. A perusal of the students' log folders indicated no undue difficulty in solving problems of this complexity when a more reasonable amount of listening time was allowed. The test as presented placed an inordinate strain on memory which was considered a faculty necessary for the solution of all problems in the pre-test, but memory should not have been necessary to the extent required in the presentation of these four tests.

Lack of support for the hypothesis that students with different levels of musical ability will show equal attainment under either selected or constructed response conditions might lead one to conclude that, insofar as this investigation is concerned, the differences in both the type and quality of faculties needed for the successful solving of problems within the two categories of response were too diversified. Attainment increased in direct proportion to the degree of learning required in solving the problems; this may be seen when the ratio of mean improvement is related to the total score possible. One might conclude also that students, at least in this age group, may be limited in their capacity to improve their conscious awareness of relationships such as those presented in the selected response-aural sections of the pre-test.

The degree of similarity of attitudes toward auditory training by means of tape-recorded self-instruction expressed by high and low achieving students suggests that the electronic laboratory may be regarded by students as an "accepted" means of receiving auditory training. In considering these findings as compared with those of the English 2600 study, a comparison of techniques should be made as well. Since this investigation did not employ the technique of linear programing and since the experience was of an auditory nature and made as pleasant as possible by the use of good sound reproduction and genuinely musical problems, the results of the two studies are not directly comparable. The acceptance of this instructional method was supported by the fact that all students did improve, and they were constantly aware of the improvement being made.

An interpretation of the findings of this investigation are necessarily subject to the limitations created by the complexion of the experimental population. Factors such as age, background, degree of professional commitment, and capacity to learn are among those that would affect the outcome of the study. One could not conclude, therefore, that the same results would occur elsewhere with different students.

With due consideration for the aforementioned limitations, the results of this study may be said to indicate that instruction of the nature directly concerned with as well as tangent to this investigation can be accomplished not only without detriment to the student but rather to his advantage. Arguments in support of the assumption that a "strong background" in the "conventional" materials and techniques of theory teaching are both desirable and necessary for an aural, aesthetic, and intellectual comprehension of music in the twentieth century will become more threadbare if other investigations of this nature yield similar findings. The unusually high degree of success achieved by the students who received laboratory and classroom instruction in contemporary practices lends support to the contention that compared to accomplishments of students in previous years, such contemporary oriented study produces a quality and consistency of "knowing" music which is superior to that obtained through "conventional" theory instruction.

With evidence of the accessibility of the stylistic complexities of contemporary music to even the youngest minds as shown in the study by Hornyak, (10) and with the plausibility, as evidenced in this study, of using contemporary music as the substance of a beginning course of music theory on the university level, increased activity should be directed toward bringing the materials and techniques of theory instruction abreast of contemporary practice in composition. Theory instructors should come to realize that the musical development of a university student need no longer be retarded because of a rather false and slavish reverence for the past or fear of the present. Teachers of music theory should realize that music is first and foremost a creative art and, because of this, the student's imagination is a precious faculty to be developed through a course of study that treats music creatively rather than a faculty to be extinguished by unmusical formulas and devices. Music is an ever changing, and today, a rapidly changing art that would most effectively be accompanied by correspondingly changing course of study.

The time is overripe for a rather large and coordinated comparison to be made between the effectiveness of the "conventional" approach to music theory instruction and a new approach with new purpose in which the substance of the course would be drawn largely from the aesthetics and practices of contemporary music. The technique of free composition would form the principal mode of classroom study and would be supported by analysis. Such a course would utilize self-instructional materials whenever these are effective, and all auditory training would be accomplished in electronic laboratories. A comparative study of this nature, after being devised by a parent institution, would be carried out in a number of cooperating collegiate institutions around the country in order to neutralize the effect of such factors as geography, types of students, curriculum patterns, institutional and individual philosophies of educating musicians, and similar factors that limit the findings of single smaller investigations. Should such a confrontation provide relatively decisive proof that the contemporary approach to musical comprehension is the more favorable of the two, institutions wishing to update music theory study could do so with reassuring immediacy.

SUMMARY

During the academic years 1964-65 and 1965-66 Ball State University, Muncie, Indiana, conducted an investigation of the AURAL AND VISUAL PERCEPTION OF MELODY IN TONAL AND ATONAL MUSICAL ENVIRONMENTS. The principal investigator was Robert W. Sherman, the research associate was Robert E. Hill, Jr., and the investigation was conducted under contract with the U.S. Department of Health, Education and Welfare.

There were three major issues formally investigated by hypothesis testing, as follows:

1) Will progress in the aural and visual perception of music through instruction based upon atonal organization transfer to progress in the aural and visual perception of tonal music,

2) Will students with different levels of ability show similar attainment in the aural and visual perception of music under conditions of

a. selected responses, and
b. constructed responses,

3) Will students with different levels of musical ability respond with similar attitudes toward tape-recorded self-instruction.

The substantive issue behind the project was that of musical instruction in tonal idioms as contrasted with musical instruction in atonal idioms. Abundant evidence exists which points out that formal instruction in music is still conducted today primarily in tonal idioms, although contemporary music tends to be atonal in nature. The most common justification for this situation frequently centers around two issues: first, the majority of "classic" or serious music is in atonal idioms, much of it centuries old; second, if fundamental instruction were given in contemporary atonal idioms only, students would be handicapped with respect to the vast majority of older serious music which is tonal in nature. This project was directed primarily toward the second of these common justifications; i.e. will atonal instruction transfer to tonal idioms?

A rather elaborate laboratory was constructed during the pilot year. The laboratory consisted of multiple student stations with stereophonic tape recorders and head sets; one-third of the stations were insulated booths in which students could sing responses required of them. A wide variety of learning tapes was available for student use if, when, and as desired. A rather sophisticated electronic central control console was utilized in the fabrication of learning and testing tapes. This type of learning opportunity might be expected to be accepted differently by more able and less able music students. This possibility led to the investigation of attitudes expressed by better achieving students and poorer achieving students toward this system of tape-recorded self-instruction.

An extensive examination was prepared, consisting of fourteen individual tests whose items were selected from a file of specially composed materials. The tests were stereophonic tape recordings of musical problems performed by faculty instrumentalists in differing ensemble combinations. They dealt with the recognition of musical intervals and melodies when heard with differing numbers of accompanying voices. Problems were set in tonal and atonal idioms in approximately equal numbers. There were two basic modes of student response; selected and constructed. Within the selected category, there were two sub-categories of aural presentation or visual presentation. Within the constructed category, there were two methods of response; written and vocal. The variety of response modes led to the question of whether student progress could be measured with similar effectiveness in any or all of these categories.

The pilot year was almost entirely consumed with the creation of the tests and with electronic and mechanical construction problems regarding the laboratory. During the experimental year, four sections of students were constituted, with twenty-five students per section.

Class instruction was entirely atonal in sections one and two, and entirely tonal in sections three and four. Laboratory instruction was entirely atonal in section one, mixed atonal-tonal in section two, entirely tonal in section three, and mixed tonal-atonal in section four. Using final grades in the course as the criterion, a multi-variant predictive equation was created for the students on the basis of their predecessors. Predicted grades for the students were used in assigning them to the various sections in such a fashion that there would be no systematic bias. The entire examination was given at the beginning of the experimental year. Instruction proceeded as planned, and the entire examination was again given at the close of the experimental year. This examination is referred to as the pre-test, or post-test, depending upon the time of administration in the reference.

Pre-test and post-test scores were considered separately as to the tonal items, the atonal items, and the total of all items. Also, the difference between each student's pre-test score and his post-test score constituted a collection of change data. Approximately 70 of the original 100 students remained at the end of the year. Analyses of covariance were performed on test data for tonal items, atonal items, and total items for each of the 14 tests. The post-test score was the criterion, and the pre-test score was the covariate for these analyses of covariance. The four class sections constituted treatment groups. The null hypothesis was retained at the .01 level for all of the 42 analyses of covariance excepting one. Thus, the evidence appears to indicate consistently and rather overwhelmingly that instruction in atonal music will transfer to tonal music. In addition, there were certain trends and tendencies noted which favored somewhat the atonal idiom. These tendencies were not amenable to statistical hypothesis testing, but their consistency makes them more than worthy of note.

Data were also analyzed with respect to the student response modes. As has been noted above, there were two basic response categories, each having two sub-categories. The reliabilities of the individual fourteen tests were calculated according to the traditional split-halves method. Fisher z transformations were made of the fourteen reliabilities, and they were combined into the four types of response categories. A chi square test was utilized to investigate the hypothesis that the reliabilities of the various tests in the sub-categories could legitimately be presumed to have come from a common or parent population of reliabilities. This hypothesis was rejected at the .01 level. It was found that the four tests which involved the longer sequences of notes as melodies were substantially more difficult and less reliable than the tests involving only intervals or very short melodic sequences. In general, the reliability of the individual tests was regarded as very satisfactory, being of the general order of .80 to .90. The four more difficult tests referred to were exceptions to this generalization. It appears reasonable to speculate that the extraordinary difficulty and complexity of these particular tests reduced their reliability, and that if the students had been permitted to hear the test items presented an additional time, the reliability might well have been increased substantially.

Difference scores, or change data, were combined for the various response categories. Means of change data were calculated for each test, and means of these means calculated for each response category. Findings here did not support the hypothesis that progress may be similarly measured in the various response categories. This is particularly evident when the amount of change is expressed as a ratio of the total number of possible items within the category. It seems reasonable to speculate that some of the selected responses were almost pure measures of perception, whereas constructed responses required and revealed a more substantial amount of learning.

The attitudes and opinions of the high scoring students were compared with the attitudes and opinions of the low scoring students using a semantic differential type of instrument prepared specifically for this project. The hypothesis of no difference between the means of two small independent samples was tested using Student's t. This null hypothesis was retained at the .01 level for all stimulus words and phrases used. Hence it is reasonable to conclude that the attitudes of the higher achieving students do not differ significantly from the attitudes of the lower achieving students with respect to this type of tape-recorded self-instruction in a laboratory setting.

Findings imply rather clearly that musical instruction in atonal idioms is not detrimental to students, even with respect to tonal idioms. The phenomenon of transfer clearly occurs between these musical categories. The favorable position of atonal idioms was clearly and consistently noted in trends and tendencies throughout the experimental year, and also subsequently. In addition, it appears that progress can be better measured when pure perception of intervals and melodies is not the crucial issue. Finally, there is a rather clear implication that tape-recorded self-instruction of the sort utilized in this project is a palatable educational approach, and equally so to both high achieving students and low achieving students.

Restrictions should be noted as to the amount and extent of generalization which is legitimate from this project. There are the usual limitations such as geography, time, nature of subjects, nature of institutions, etc. It would appear desirable to have additional research of this general nature conducted elsewhere in other kinds of institutions and with subjects who would vary as to age, academic specialty, etc. The four class sections required two instructors, and each taught in one idiom only; the mixture of idioms took place in the laboratory. Despite this, an uncontrolled teacher variable was still present. Within the limitations of this study, however, it would appear justified to suggest that musical instruction could well take place within atonal idioms, the present lack of which is a cause for concern and lament among numbers of music educators.

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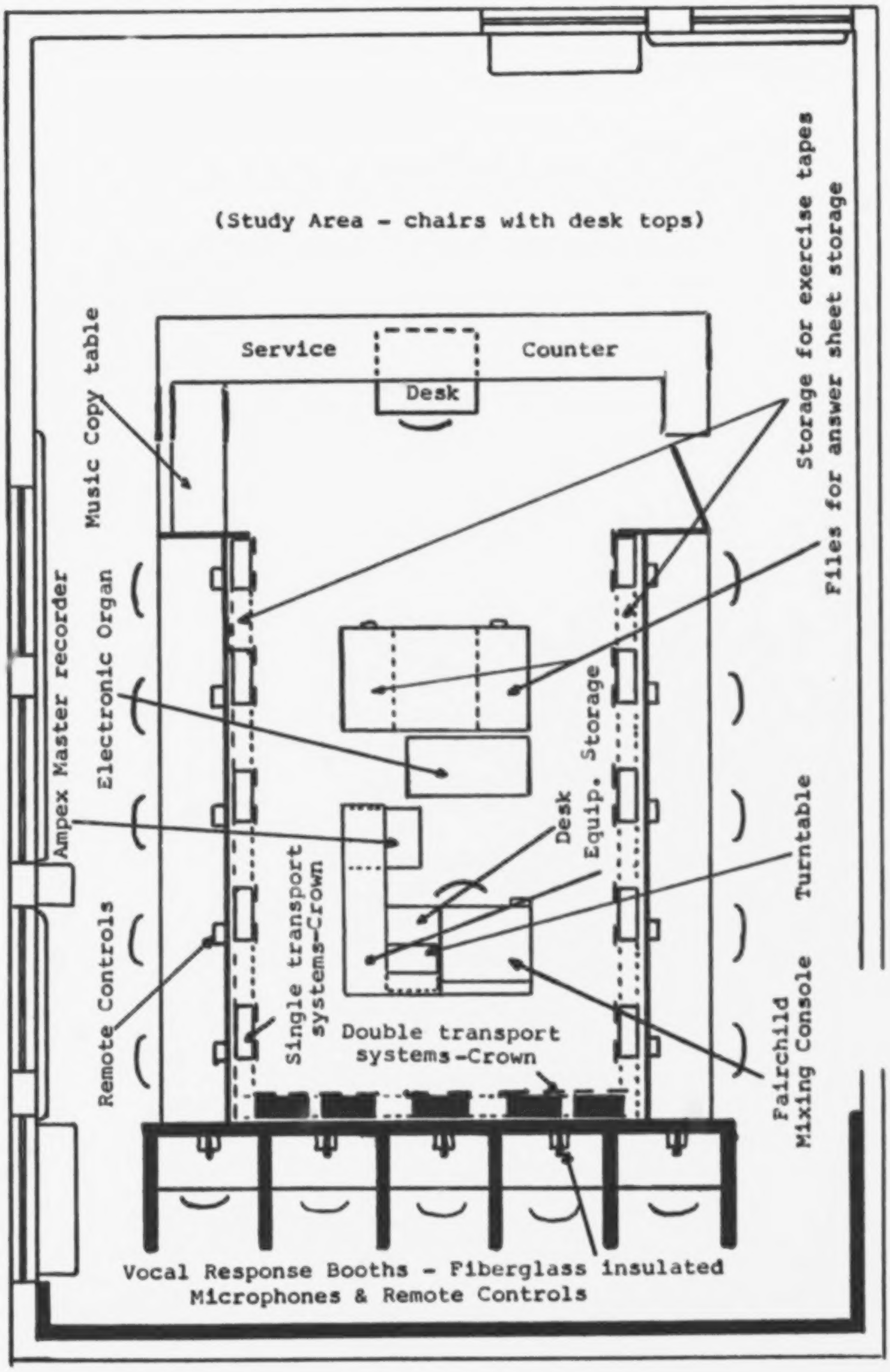
Music Theory Lab Room 401
Music Building

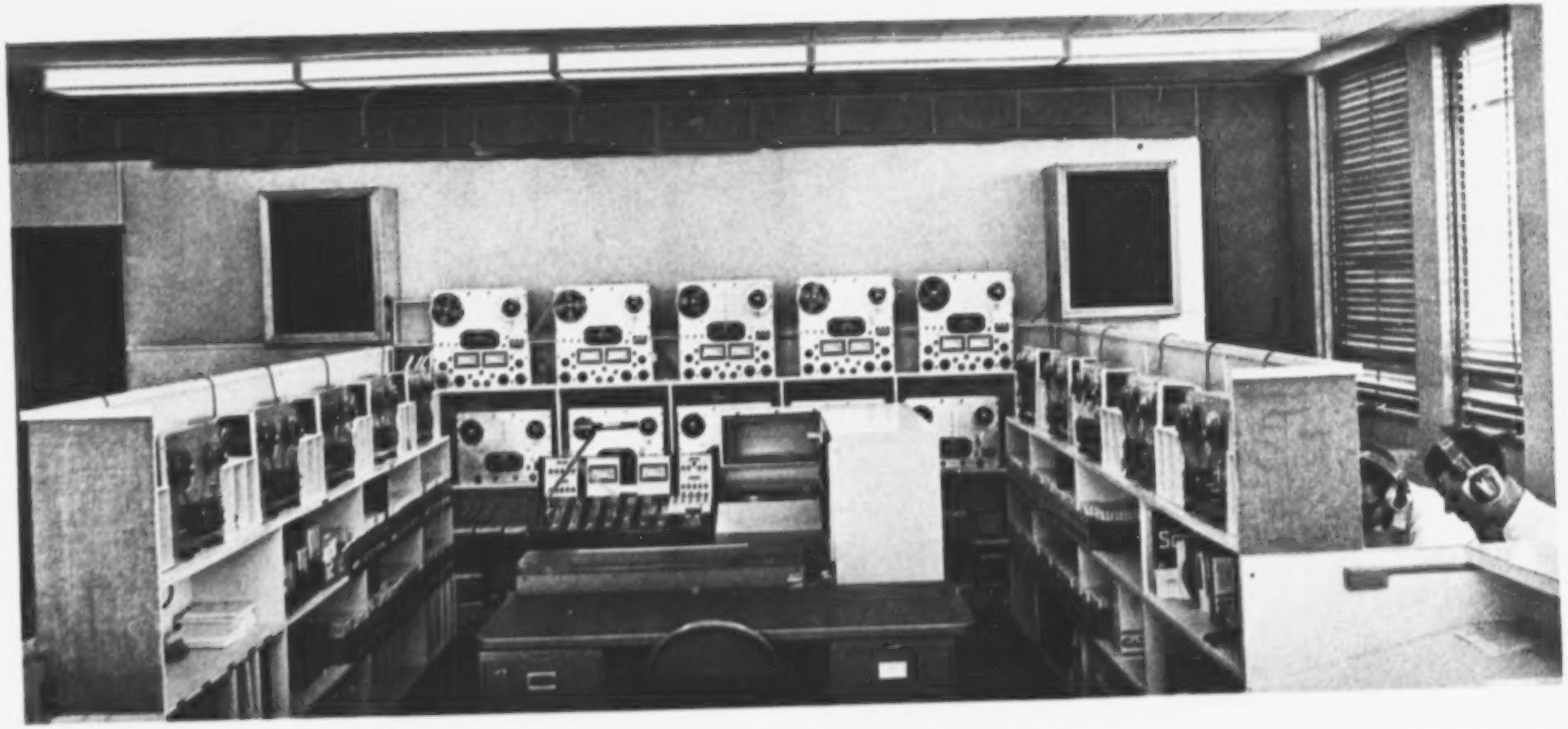

(Study Area - chairs with desk tops)
Service
Counter
Desk
Music Copy table
Storage for exercise tapes
Files for answer sheet storage
Ampex Master recorder
Electronic Organ
Equip. Storage
Desk
Turntable
Remote Controls
Single transport systems-Crown
Double transport systems-Crown
Fairchild Mixing Console
Vocal Response Booths - Fiberglass insulated
Microphones & Remote Controls

MUSIC THEORY LABORATORY

Left Bank Single Transport
Stereo Systems

Rear Bank Double Transport
Stereo Systems

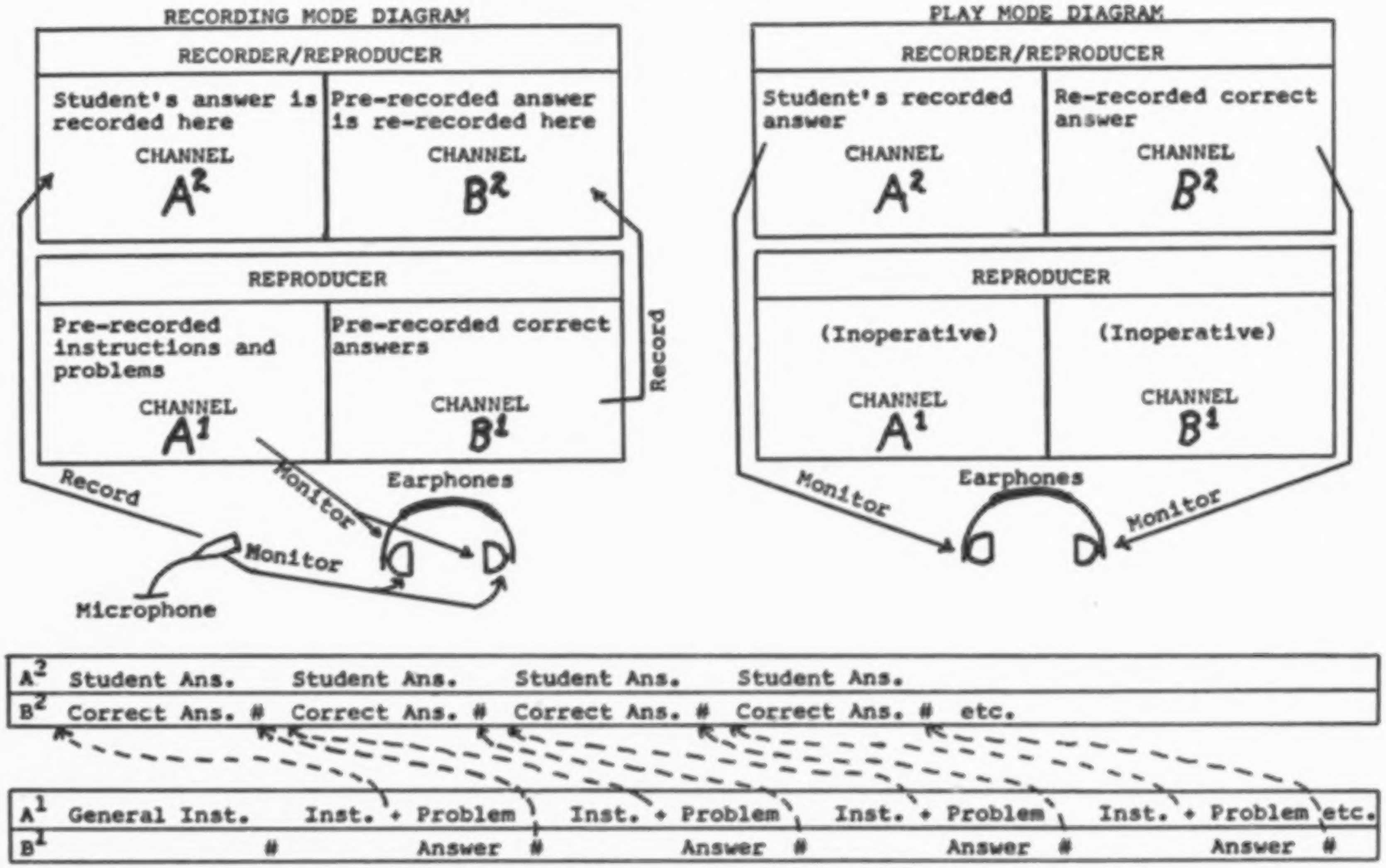
Right Bank Single Transport
Stereo Systems



SINGLE TRANSPORT STEREO SYSTEM
REMOTE CONTROL UNIT

DOUBLE TRANSPORT STEREO SYSTEM
REMOTE CONTROL UNIT

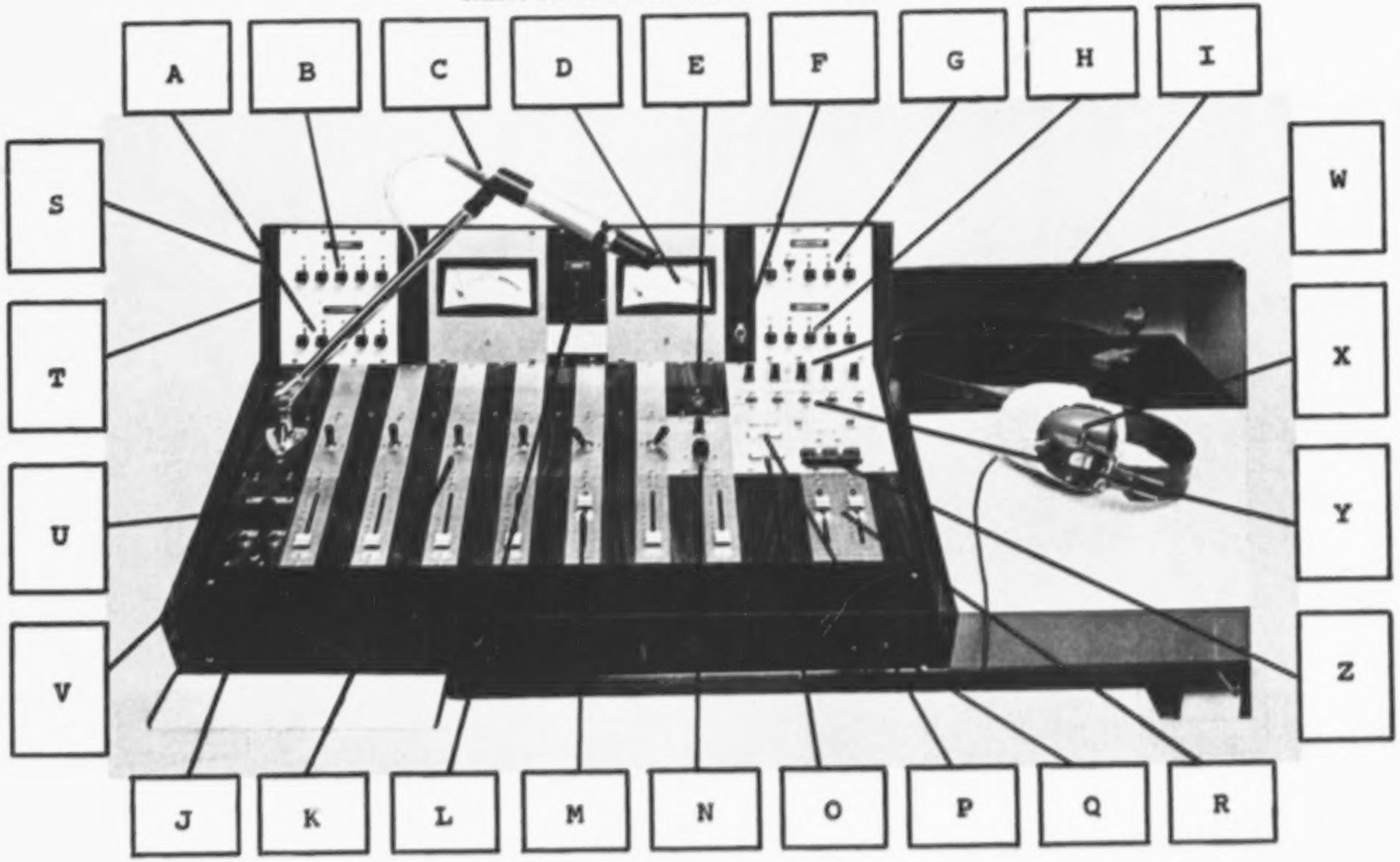
DOUBLE TRANSPORT SYSTEM


RECORDING MODE DIAGRAM
RECORDER/REPRODUCER
Student's answer is recorded here
CHANNEL A^2
Pre-recorded answer is re-recorded here
CHANNEL B^2
REPRODUCER
Pre-recorded instructions and problems
CHANNEL A^1
Pre-recorded correct answers
CHANNEL B^1
Record
Record
Monitor
Monitor
Earphones
Microphone
PLAY MODE DIAGRAM
RECORDER/REPRODUCER
Student's recorded answer
CHANNEL A^2
Re-recorded correct answer
CHANNEL B^2
REPRODUCER
(Inoperative)
CHANNEL A^1
(Inoperative)
CHANNEL B^1
Monitor
Monitor
Earphones
A^2 Student Ans. Student Ans. Student Ans. Student Ans.
B^2 Correct Ans. # Correct Ans. # Correct Ans. # Correct Ans. # etc.
A^1 General Inst. Inst. + Problem Inst. + Problem Inst. + Problem Inst. + Problem etc.
B^1 # Answer # Answer # Answer # Answer #

+ Recorded 60 cycle tone used to start the RECORDER/REPRODUCER.

Recorded 60 cycle tone used to stop both transports. This tone is re-recorded on CHANNEL B^2 while the student is working the excercise and serves to mark the beginning of problems during rewind and to stop the RECORDER/REPRODUCER when the control is in PLAY MODE.

FAIRCHILD STEREO MIXING CONSOLE
and
REMOTE OPERATIONS CENTER


A
B
C
D
E
F
G
H
I
S
T
U
V
W
X
Y
Z
J
K
L
M
N
O
P
Q
R

LEGEND

FAIRCHILD STEREO MIXING CONSOLE
and
REMOTE OPERATIONS CENTER

A. Remote operation selector switches for the left bank of Crown reproducers.

B. Remote operation selector switches for the rear bank of Crown recorder/reproducers.

C. University 2200 microphone.

D. VU meters.

E. Power amplifier lockout switch.

F. Remote control lock switch.

G. Remote operation selector switches for the rear bank of Crown reproducers.

H. Remote operation selector switches for the right bank of Crown reproducers.

I. Acoustic-Research Turntable.

J. Button for "stop tone" generator.

K. Three-position stereo keys.

L. Remote operation selector switch for the Ampex 351-2.

M. Fairchild lumiten attenuators for the inputs of the right and left banks of reproducers, the turntable, and the microphone.

N. Microphone on-off switch and pan pot.

O. Record mode and stop buttons for remote operation of the five Crown recorder/reproducers.

P. Record mode buttons for remote operation of the Ampex 351-2.

Q. Selector switch and phone jack for monitoring the five Crown recorder/reproducers, the Ampex 351-2, or the mixing board.

R. Fairchild lumiten master attenuators for A and B channels.

S. Rear panel containing all input and output cables.

T. Rear input cables from the Thomas electronic organ, and the input and output cables for the Ampex 351-2.

U. Calibration switch for the "stop tone" and "start tone" generator.

V. Button for "start tone" generator.

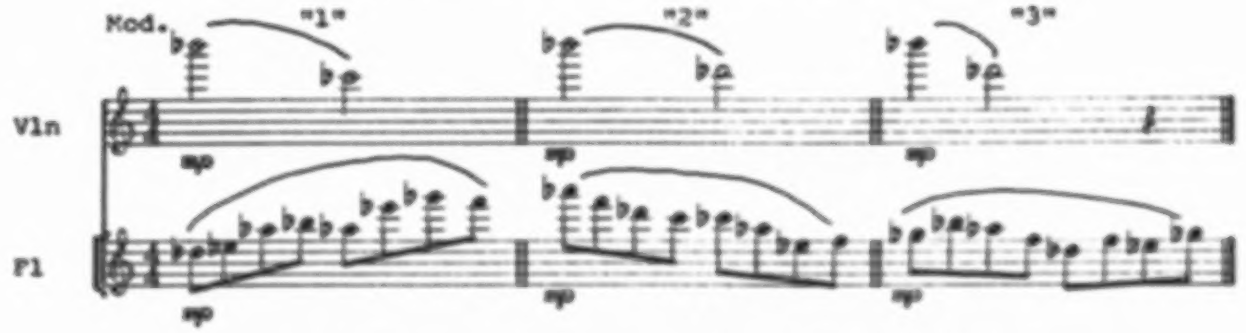
W. Input selector switches for the right and left banks of Crown reproducers.

X. Superex earphones.

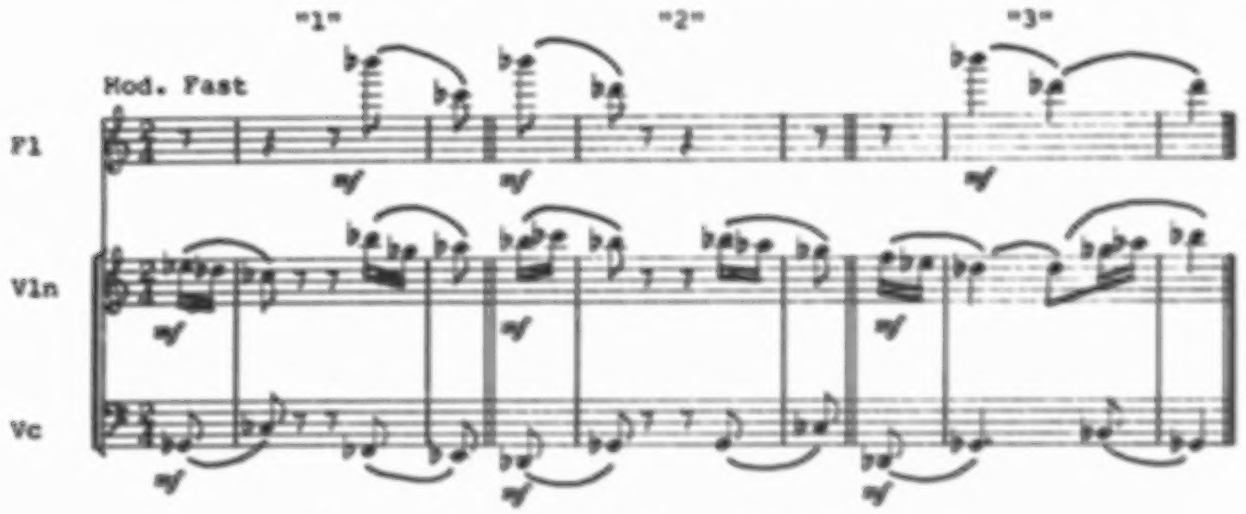
Y. Remote record mode selector switches for the five Crown recorder/reproducers.

Z. Remote control rewind, play, fast forward, and stop buttons for the operation of all units.

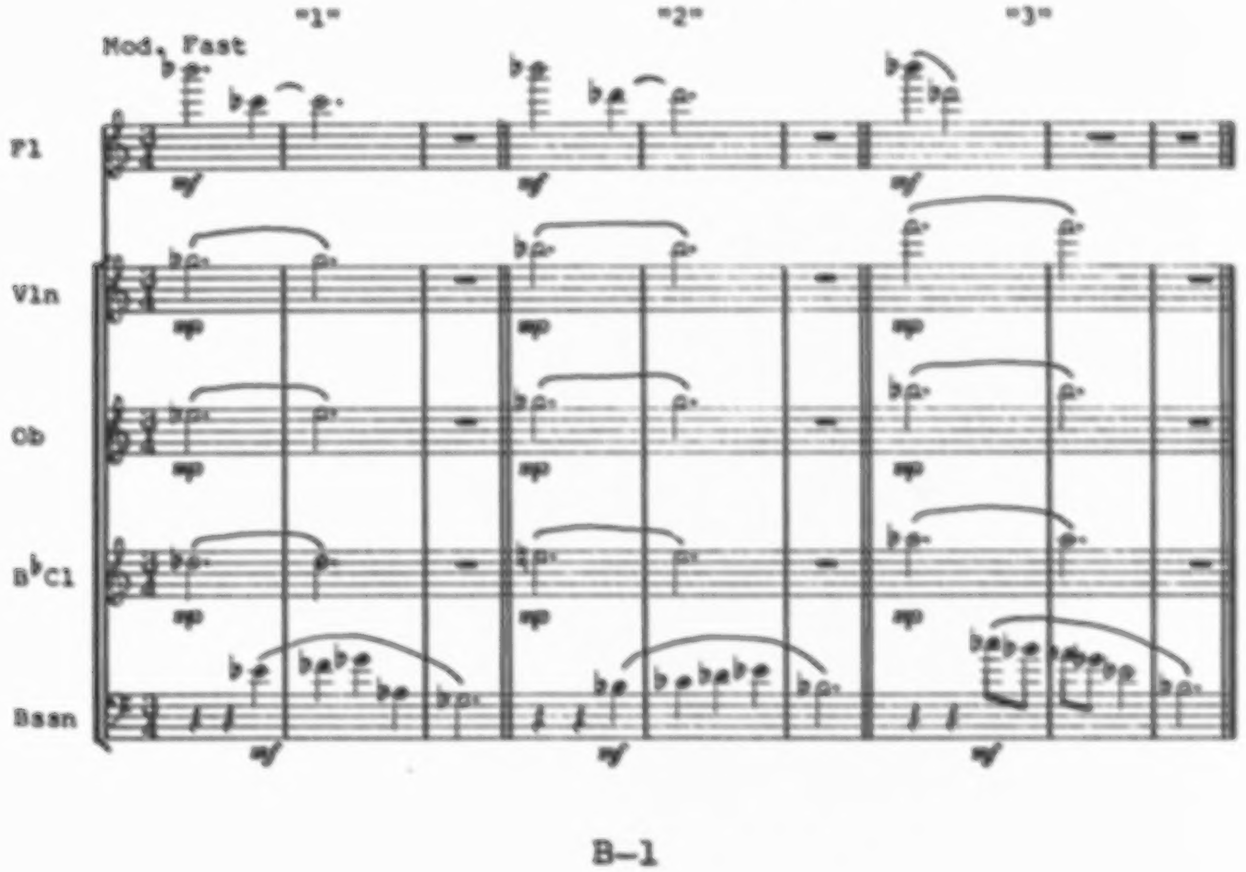
M7 ↓ - TONAL - HIGH RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod.
Vln
Fl
mp

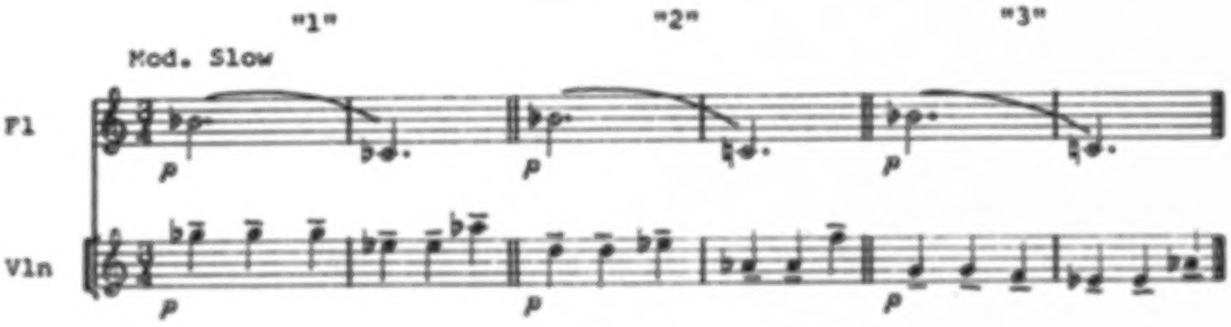
M7 ↓ - TONAL - HIGH RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Mod. Fast
Fl
Vln
Vc
mf

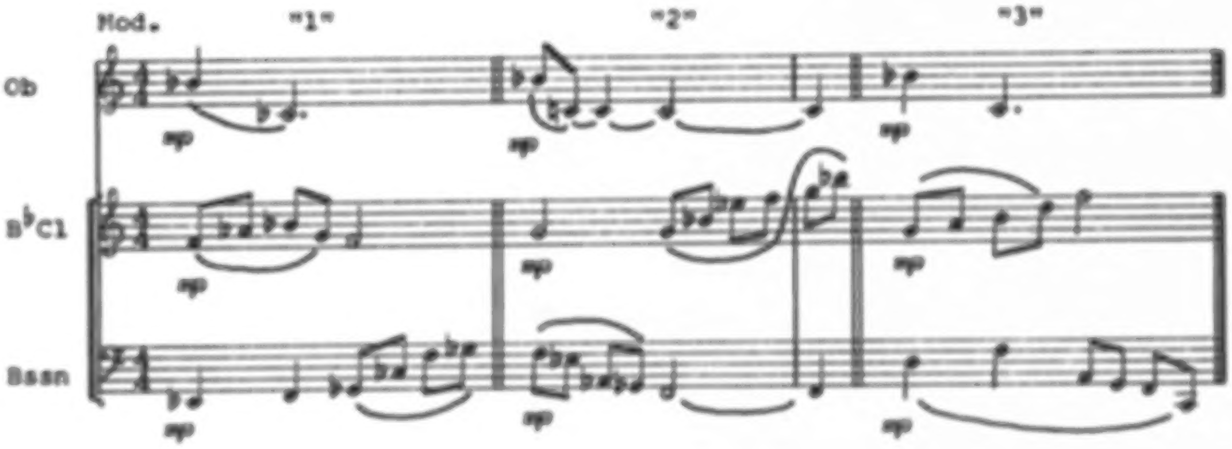
M7 ↓ - TONAL - HIGH RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod. Fast
Fl
Vln
Ob
B♭Cl
Bssn
mf
mp

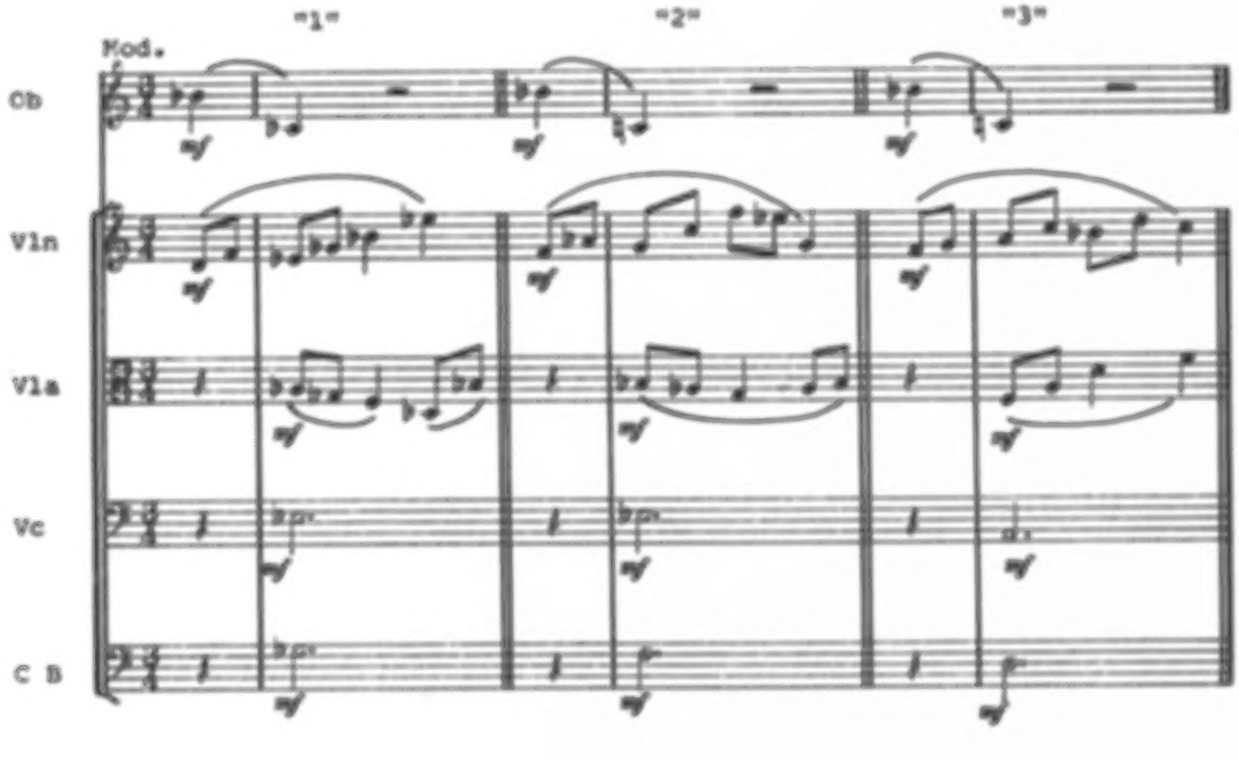
M7 ↓ - TONAL - MEDIUM RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod. Slow
Fl
Vln
p

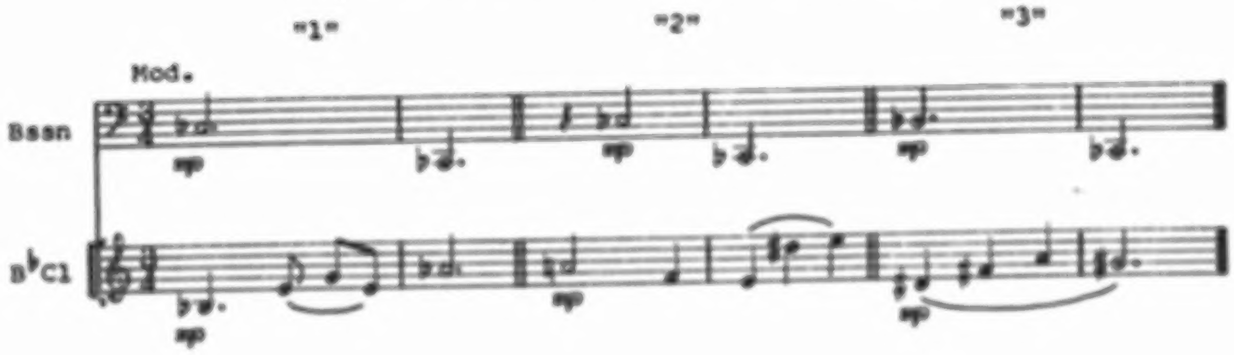
M7 ↓ - TONAL - MEDIUM RANGE - TWO OTHER VOICES


Mod.
"1"
"2"
"3"
Ob
B♭Cl
Bssn
mp

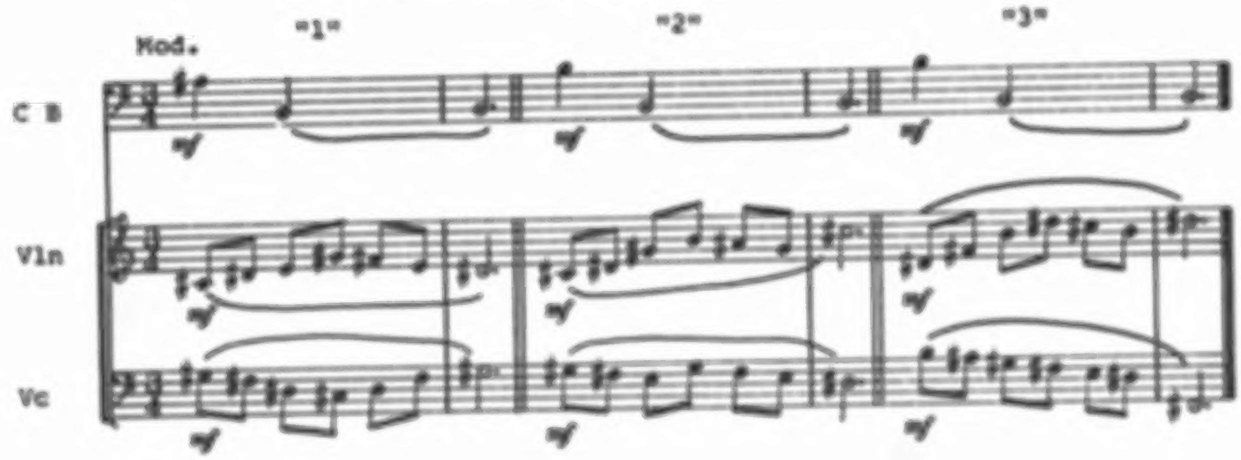
M7 ↓ - TONAL - MEDIUM RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod.
Ob
Vln
Vla
Vc
C B
mf

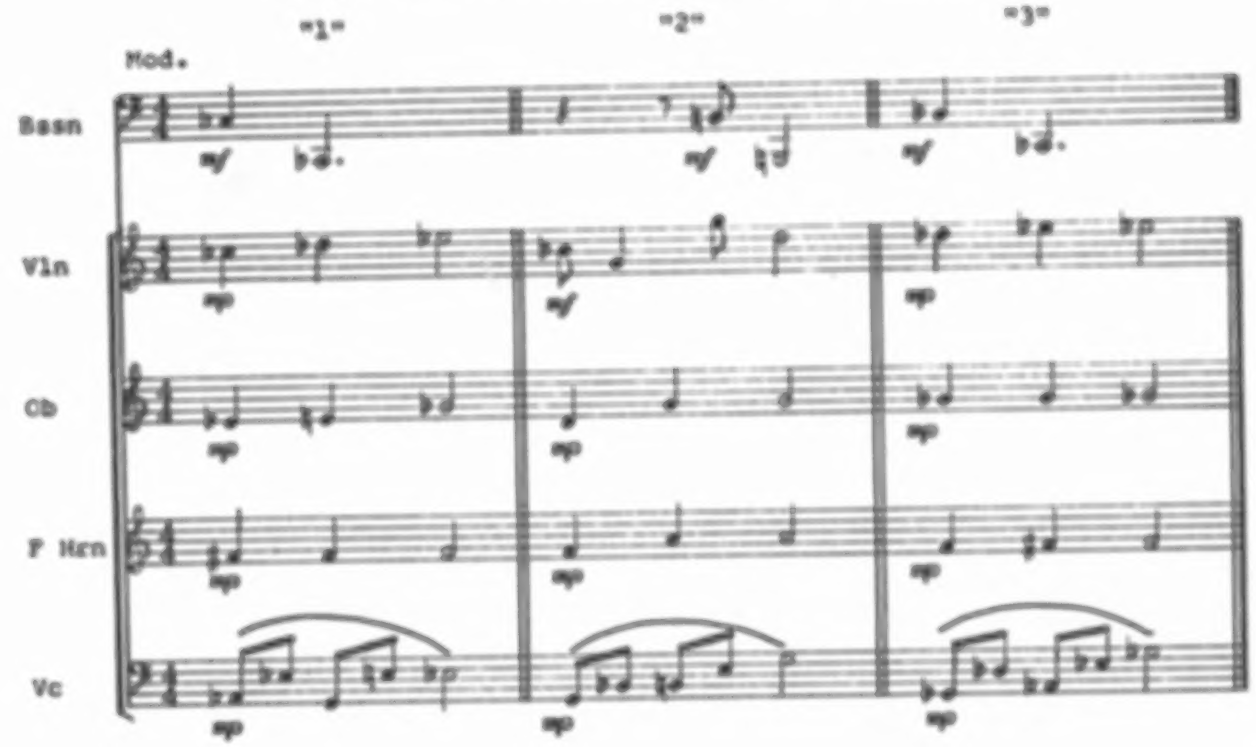
M7 ↓ - TONAL - LOW RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod.
Bssn
B♭Cl
mp

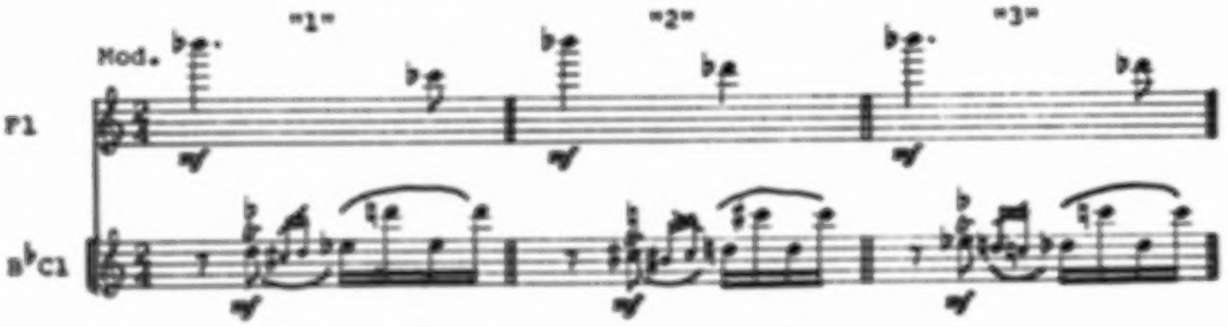
M7 ↓ - TONAL - LOW RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Mod.
C B
Vln
Vc
mf

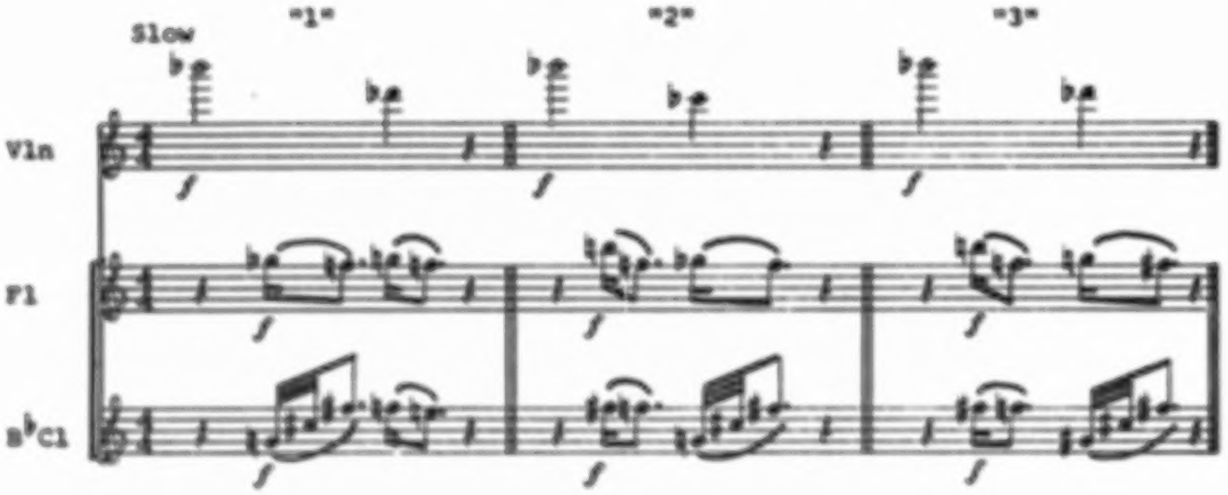
M7 ↓ - TONAL - LOW RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod.
Bssn
Vln
Ob
F Hrn
Vc
mf
mp

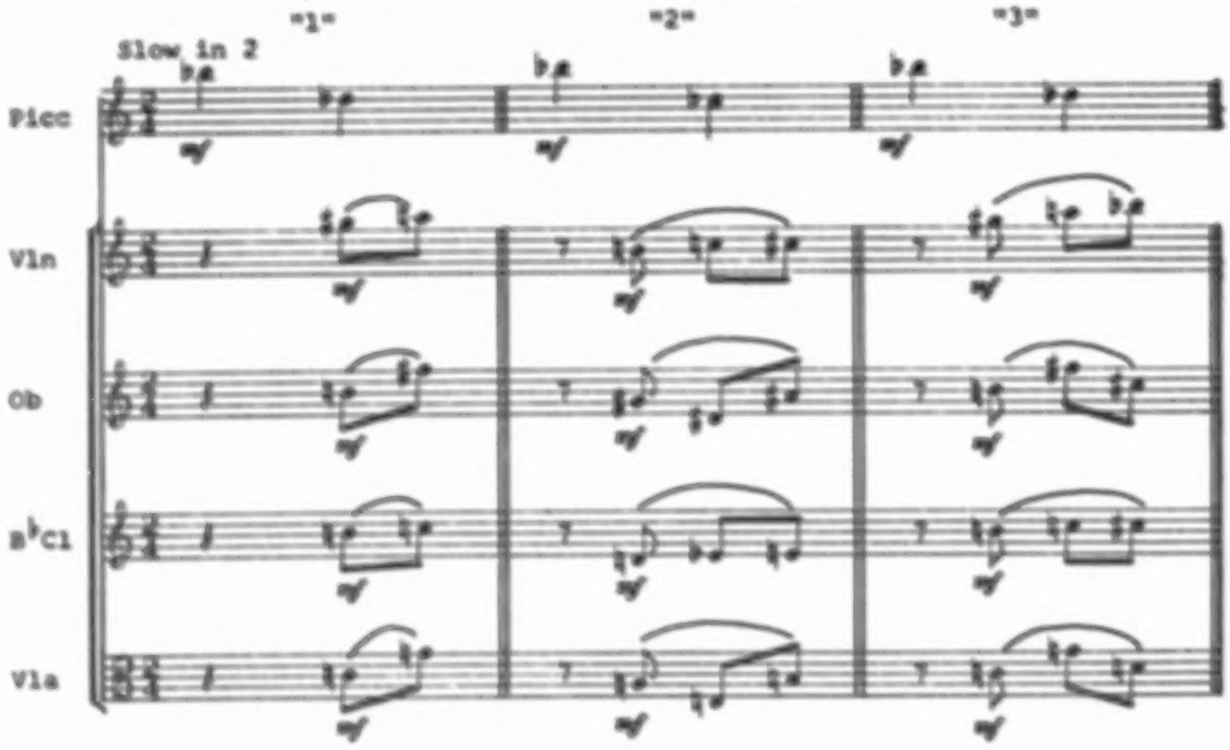
M7 ↓ - ATONAL - HIGH RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod.
Fl
B♭Cl
mf

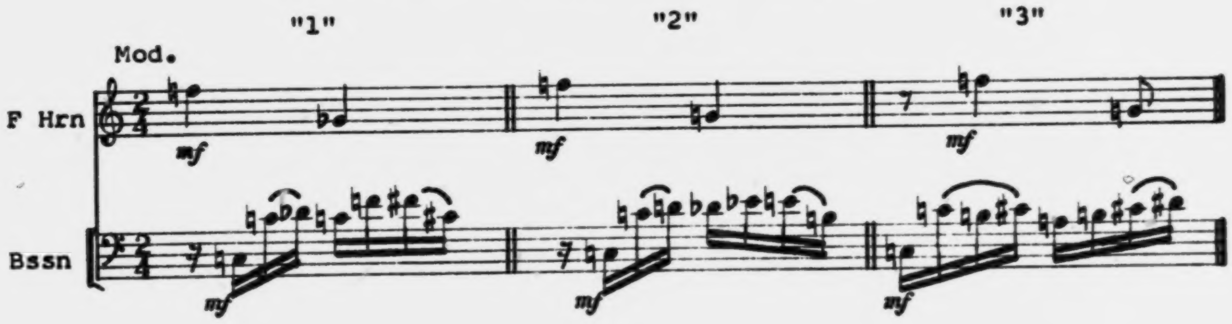
M7 ↓ - ATONAL - HIGH RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Slow
Vln
Fl
B♭Cl
f

M7 ↓ - ATONAL - HIGH RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Slow in 2
Picc
Vln
Ob
B♭Cl
Vla
mf

M7 ↓ - ATONAL - MEDIUM RANGE - ONE OTHER VOICE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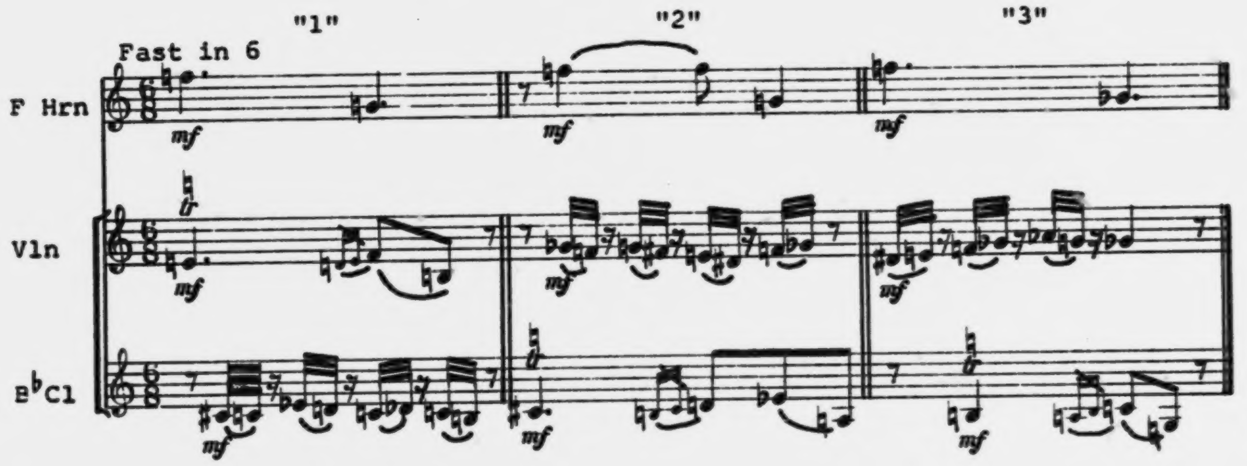
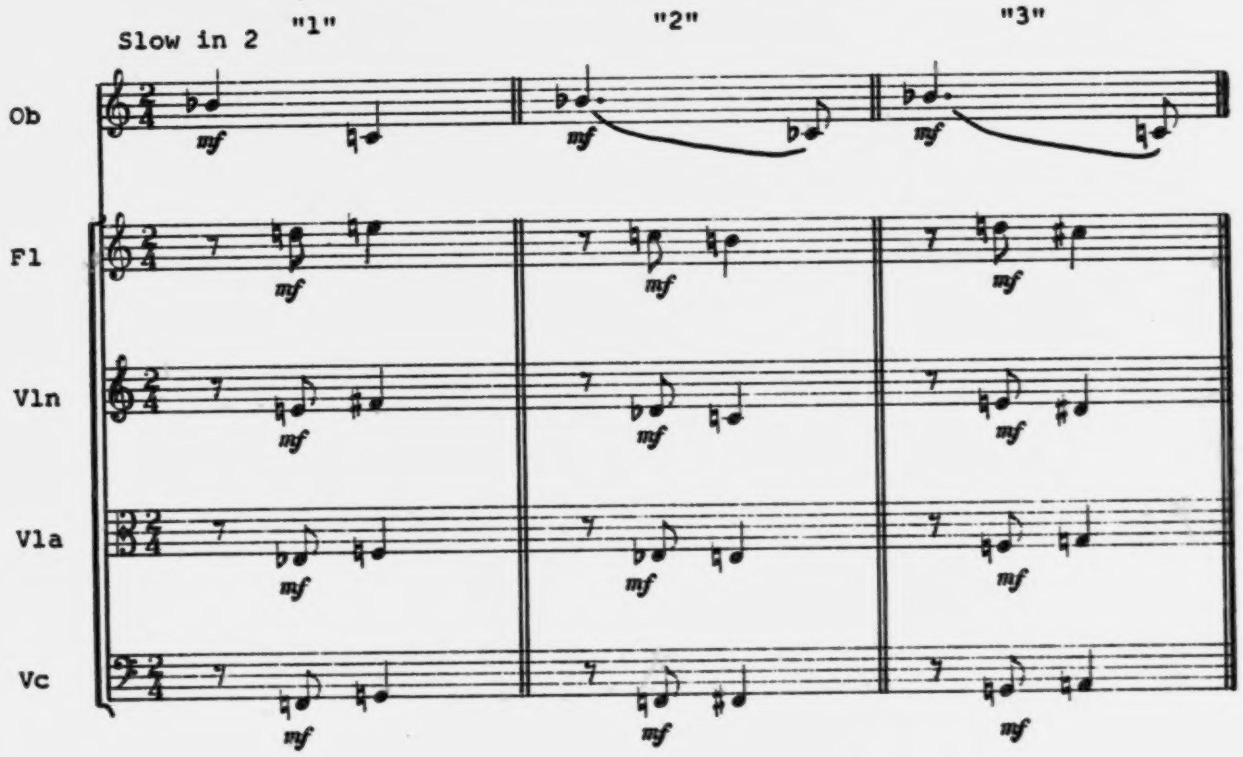
"2"
"3"
Mod.
F Hrn
Bssn
mf

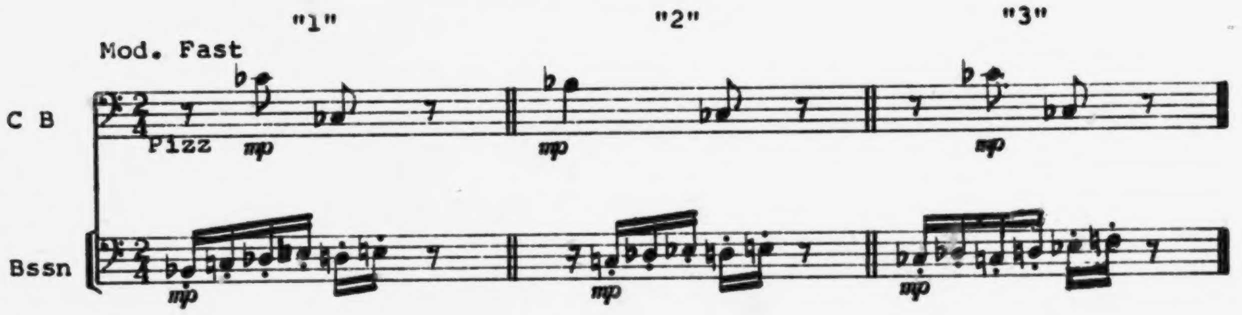
M7 ↓ - ATONAL - MEDIUM RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Fast in 6
F Hrn
Vln
B♭Cl
tr
mf

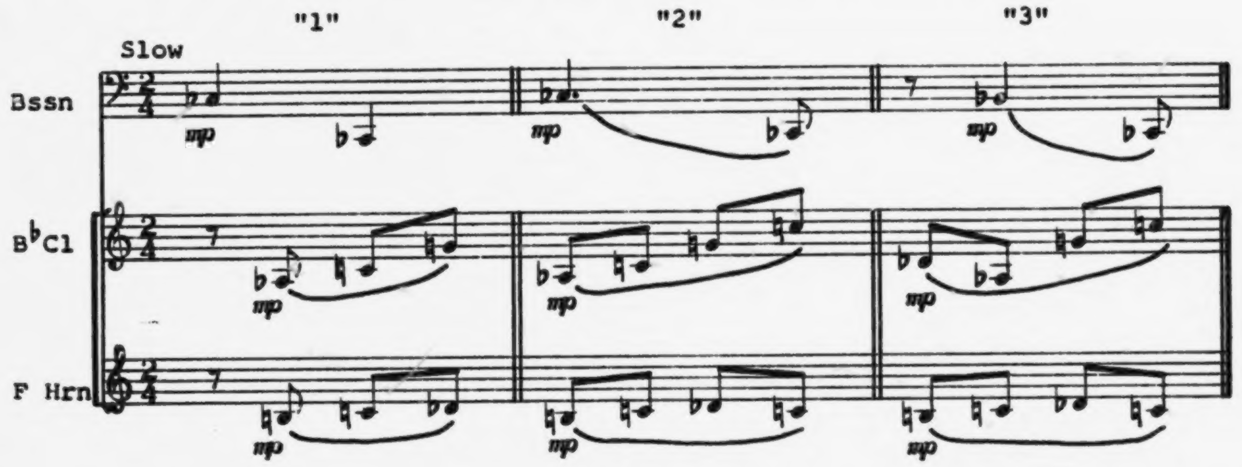
M7 ↓ - ATONAL - MEDIUM RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Slow in 2
Ob
Fl
Vln
Vla
Vc
mf

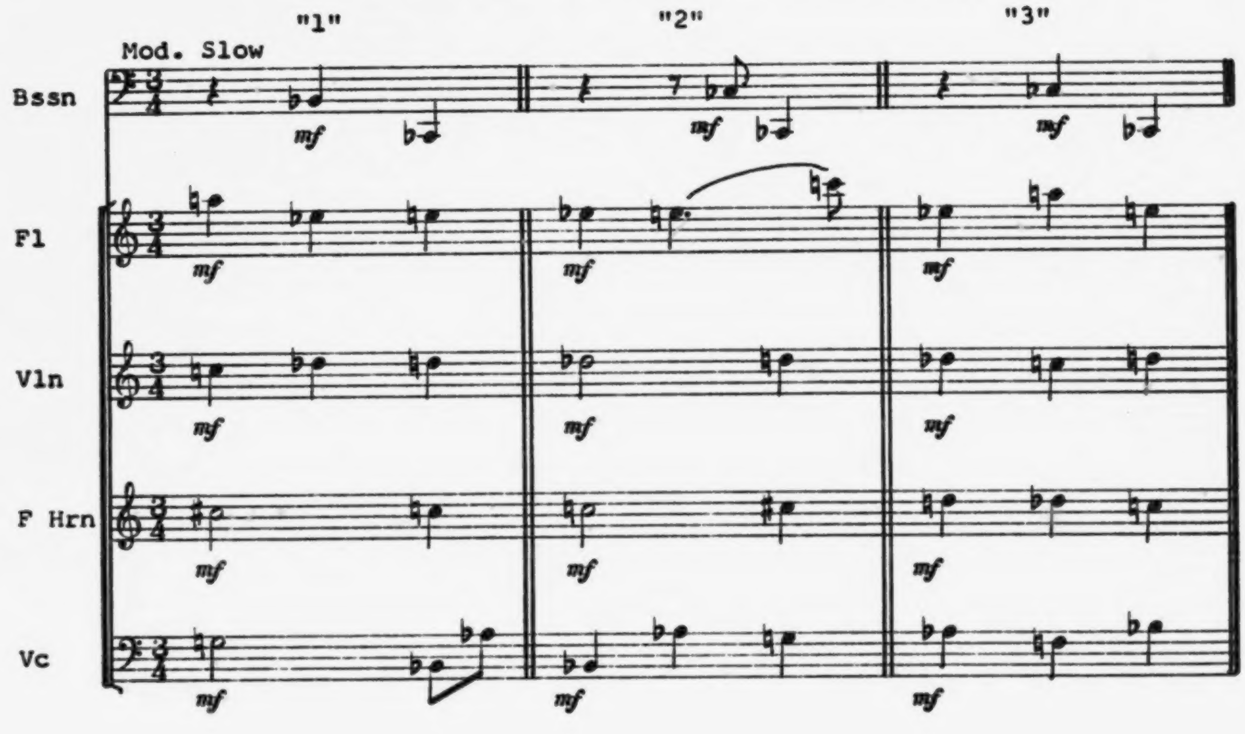
M7 - ATONAL - LOW RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod. Fast
C B
Pizz
mp
mp
mp
Bssn
mp
mp
mp

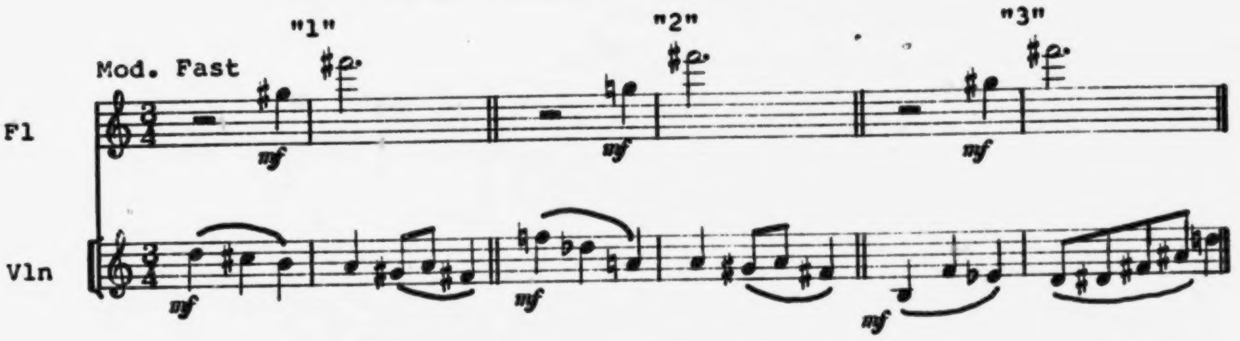
M7 - ATONAL - LOW RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Slow
Bssn
mp
mp
mp
B♭Cl
mp
mp
mp
F Hrn
mp
mp
mp

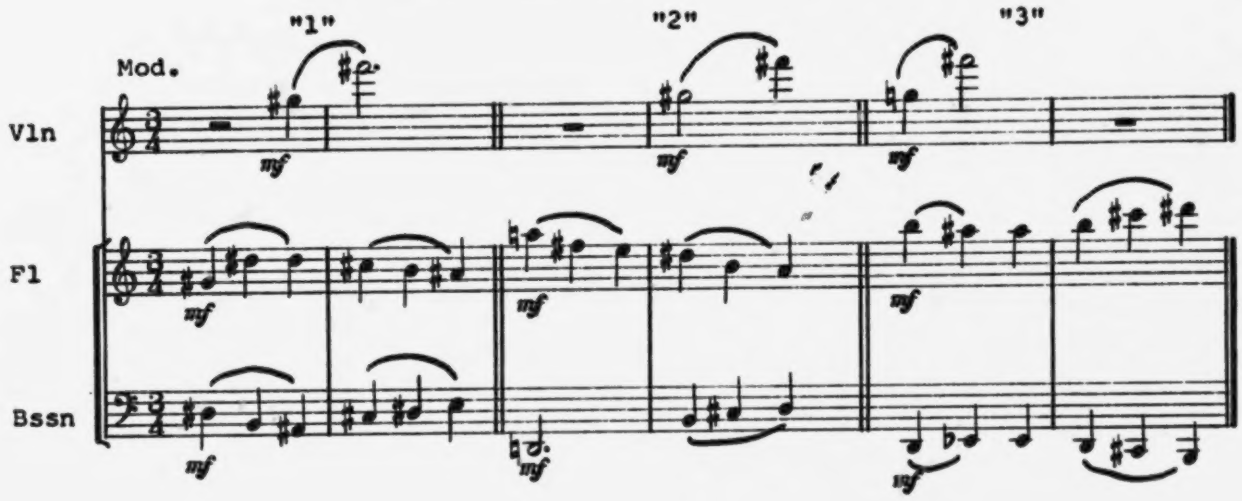
M7 - ATONAL - LOW RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod. Slow
Bssn
mf
mf
mf
Fl
mf
mf
mf
Vln
mf
mf
mf
F Hrn
mf
mf
mf
Vc
mf
mf
mf

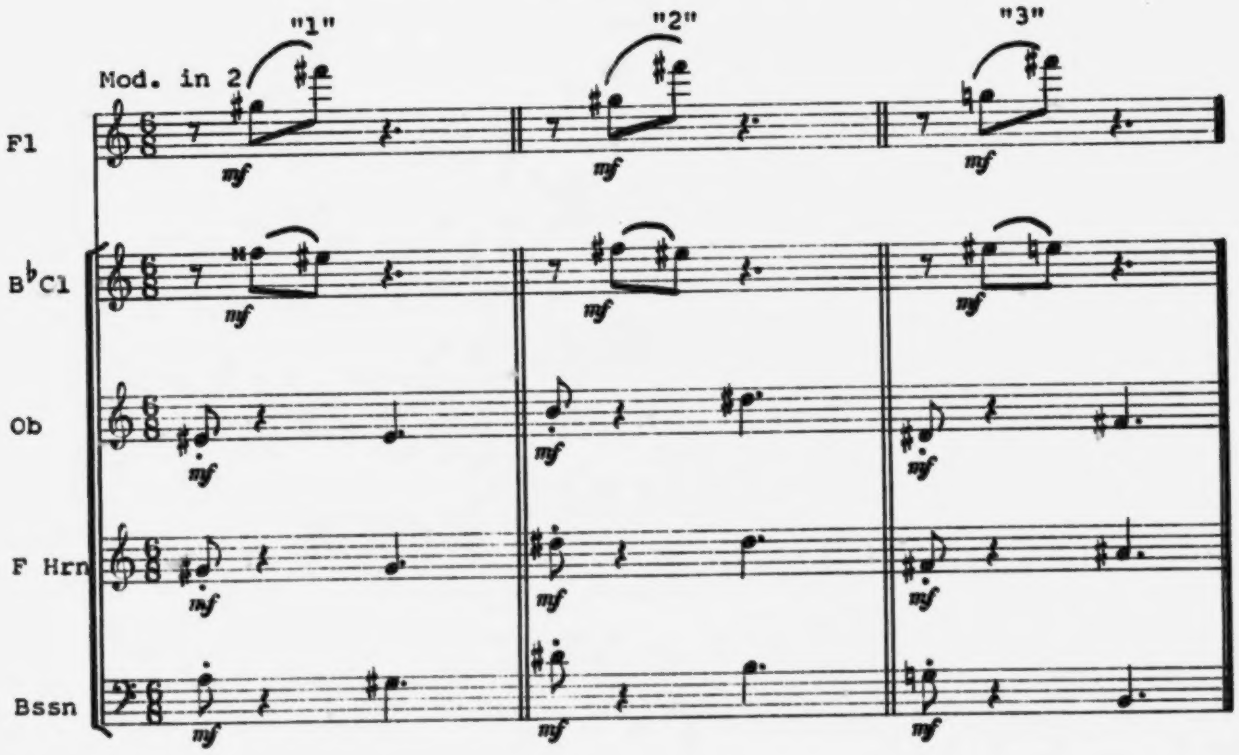
M7 ↑ - TONAL - HIGH RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod. Fast
Fl
Vln
mf

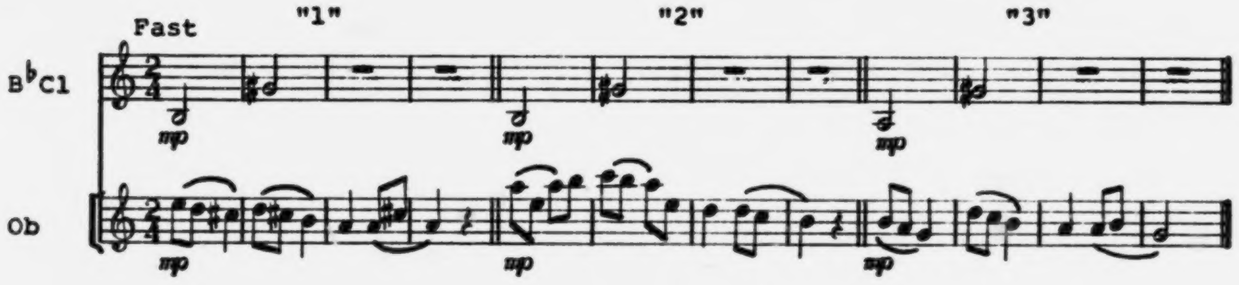
M7 ↑ - TONAL - HIGH RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Mod.
Vln
Fl
Bssn
mf

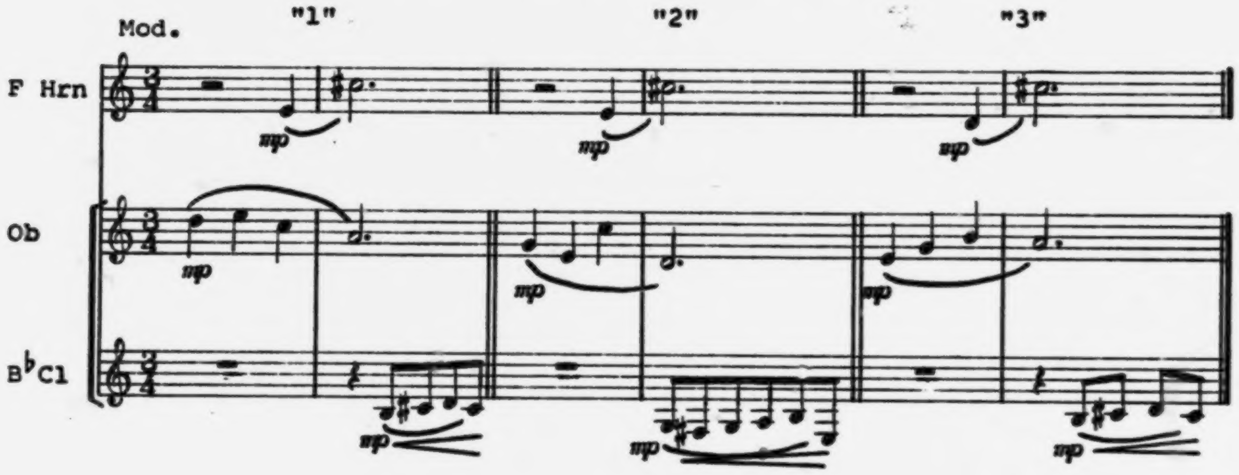
M7 ↑ - TONAL - HIGH RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod. in 2
Fl
B♭Cl
Ob
F Hrn
Bssn
mf

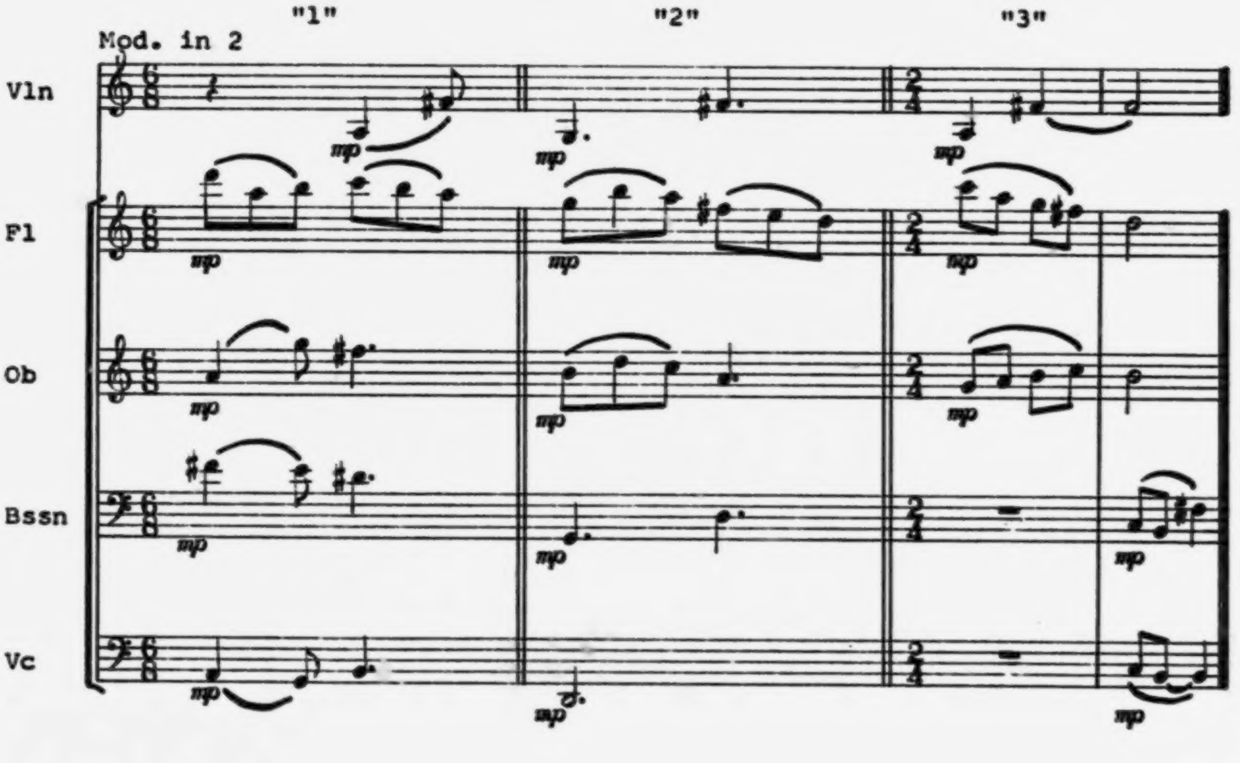
M7 ↑ - TONAL - MEDIUM RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Fast
B♭Cl
Ob
mp

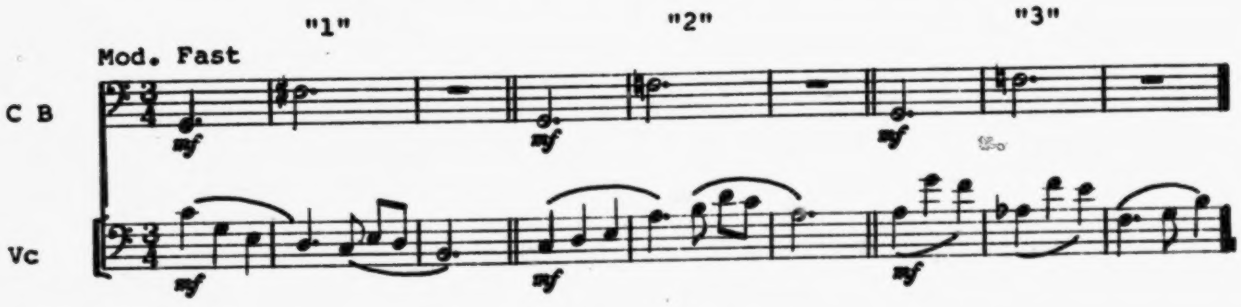
M7 ↑ - TONAL - MEDIUM RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Mod.
F Hrn
Ob
B♭Cl
mp

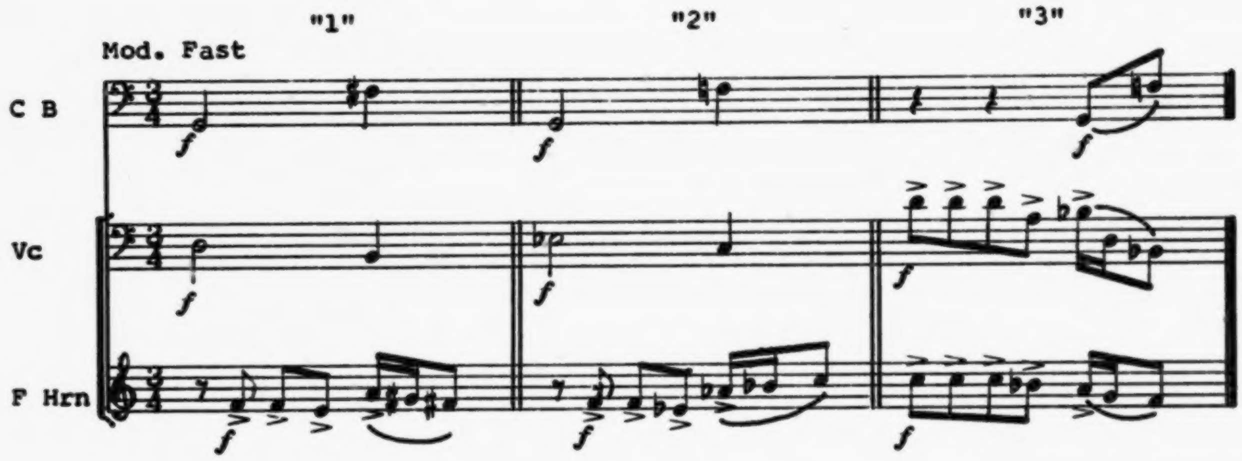
M7 ↑ - TONAL - MEDIUM RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod. in 2
Vln
Fl
Ob
Bssn
Vc
mp

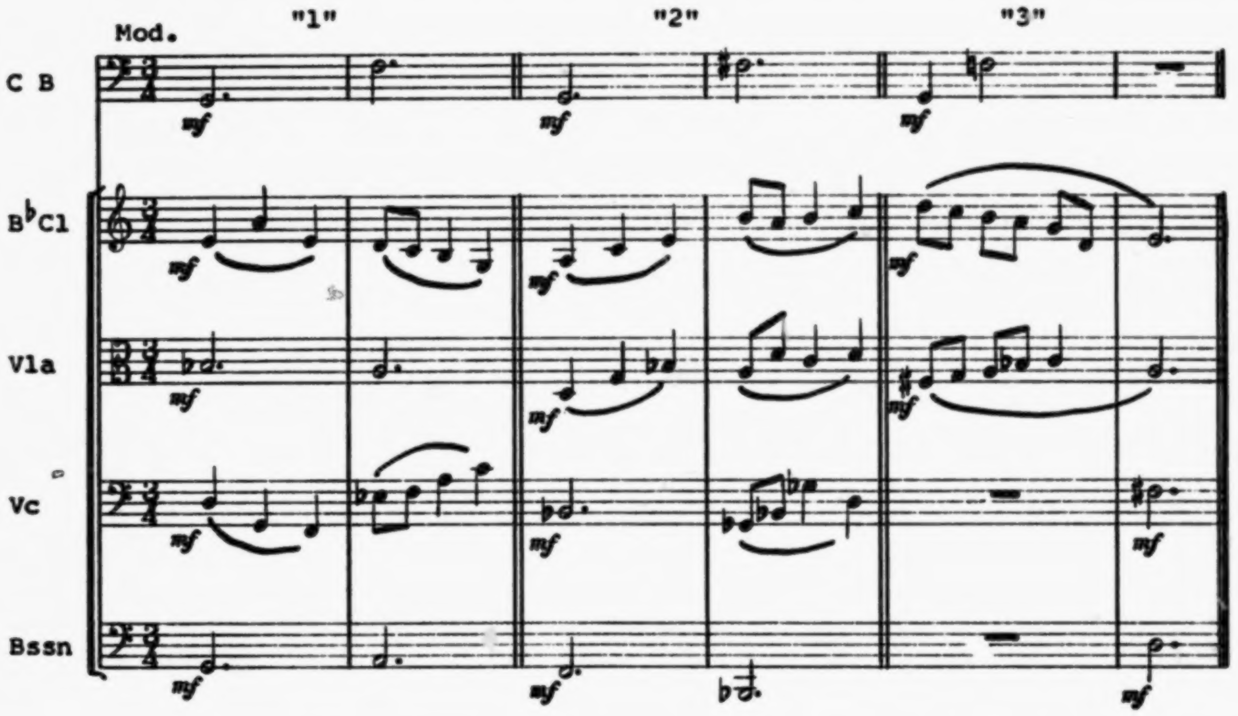
M7 ↑ - TONAL - LOW RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod. Fast
C B
Vc
mf

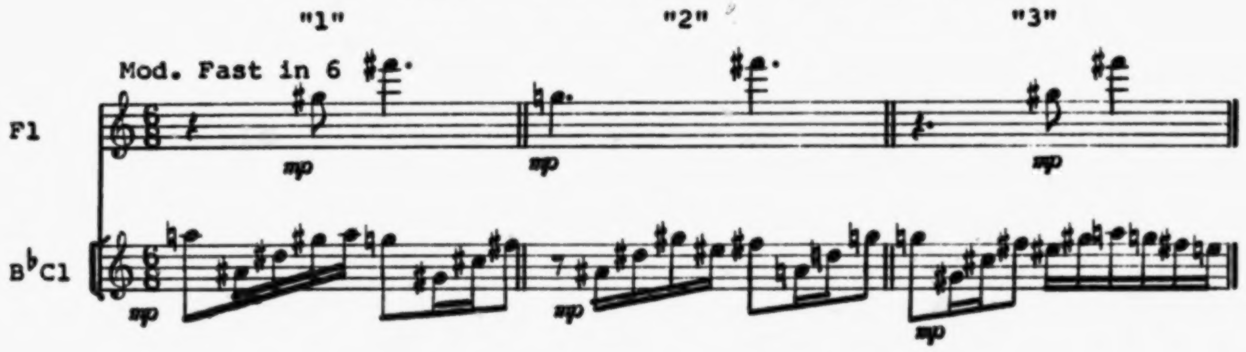
M7 ↑ - TONAL - LOW RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Mod. Fast
C B
Vc
F Hrn
f

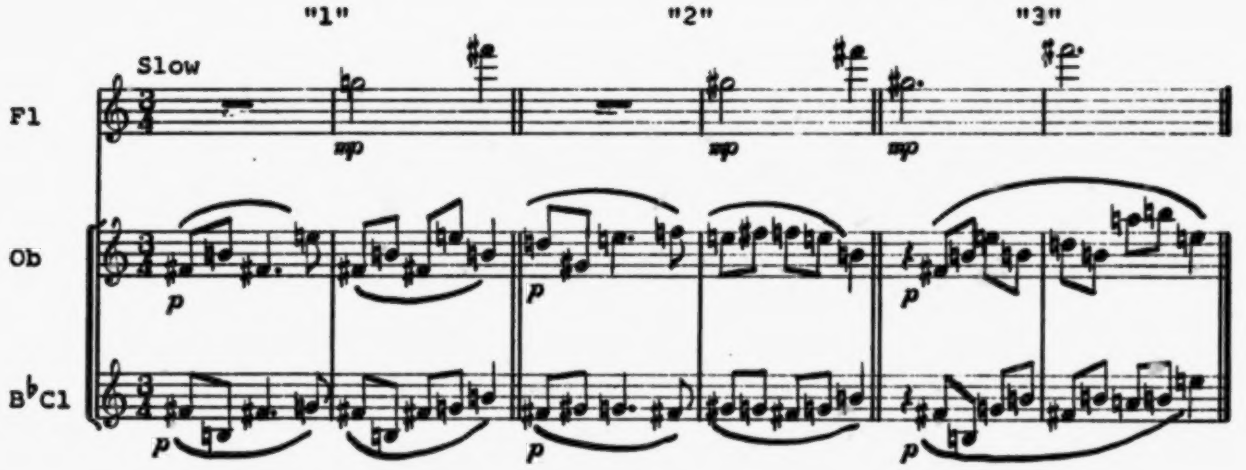
M7 ↑ - TONAL - LOW RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod.
C B
B♭Cl
Vla
Vc
Bssn
mf

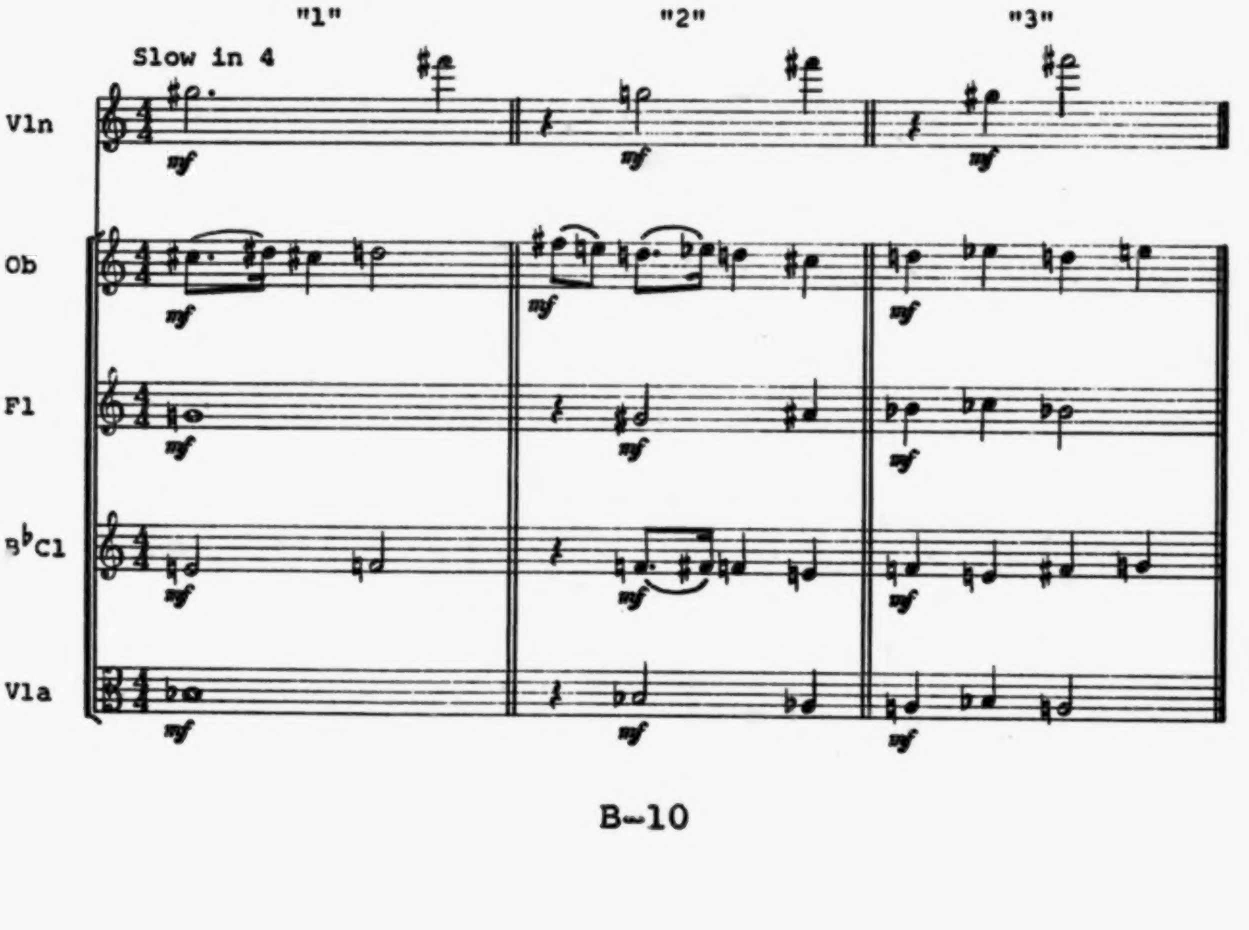
M7 ↑ - ATONAL - HIGH RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod. Fast in 6
Fl
B♭Cl
mp

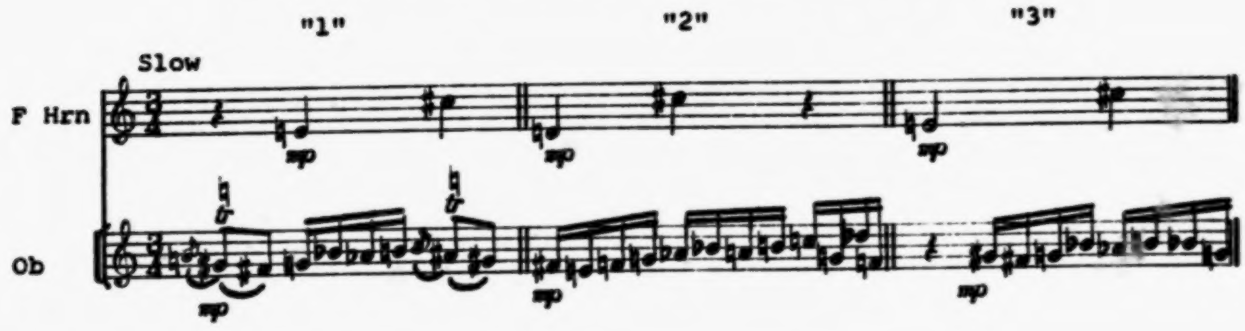
M7 ↑ - ATONAL - HIGH RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Slow
Fl
Ob
B♭Cl
mp
p

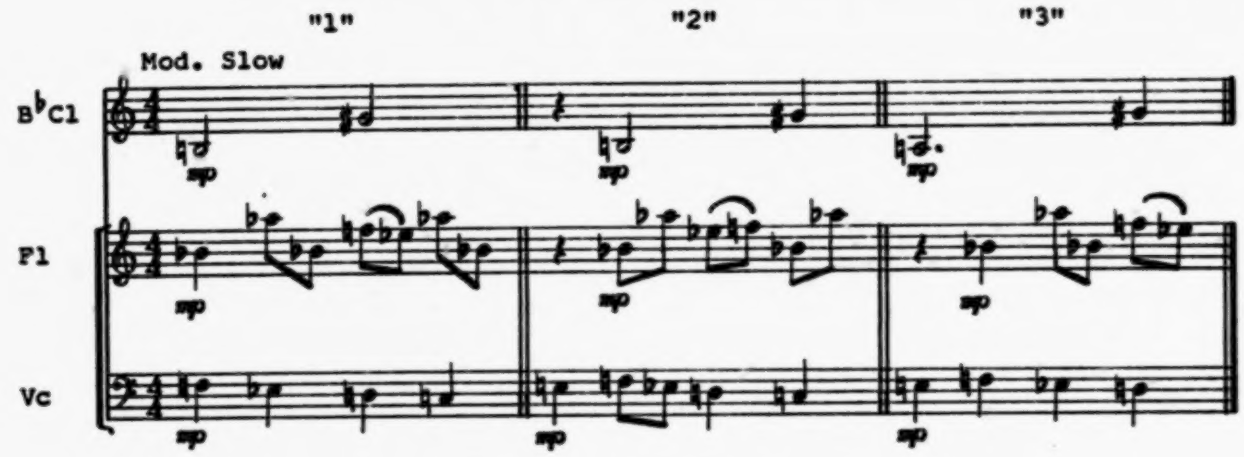
M7 ↑ - ATONAL - HIGH RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Slow in 4
Vln
Ob
Fl
B♭Cl
Vla
mf

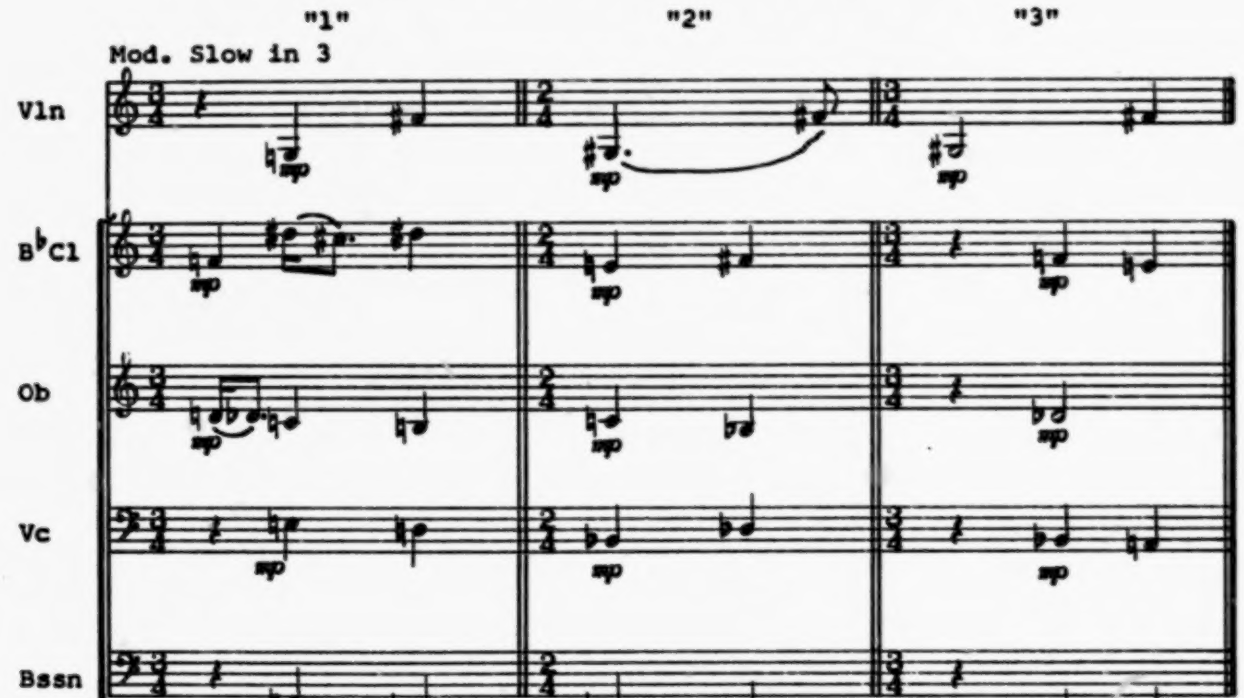
M7 ↑ - ATONAL - MEDIUM RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Slow
F Hrn
Ob
mp
tr

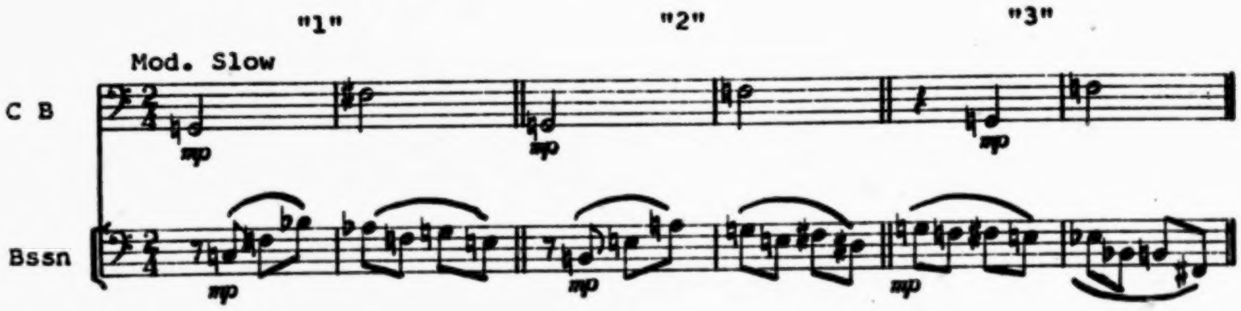
M7 ↑ - ATONAL - MEDIUM RANGE - TWO OTHER VOICES


"1"
"2"
"3"
Mod. Slow
B♭Cl
Fl
Vc
mp

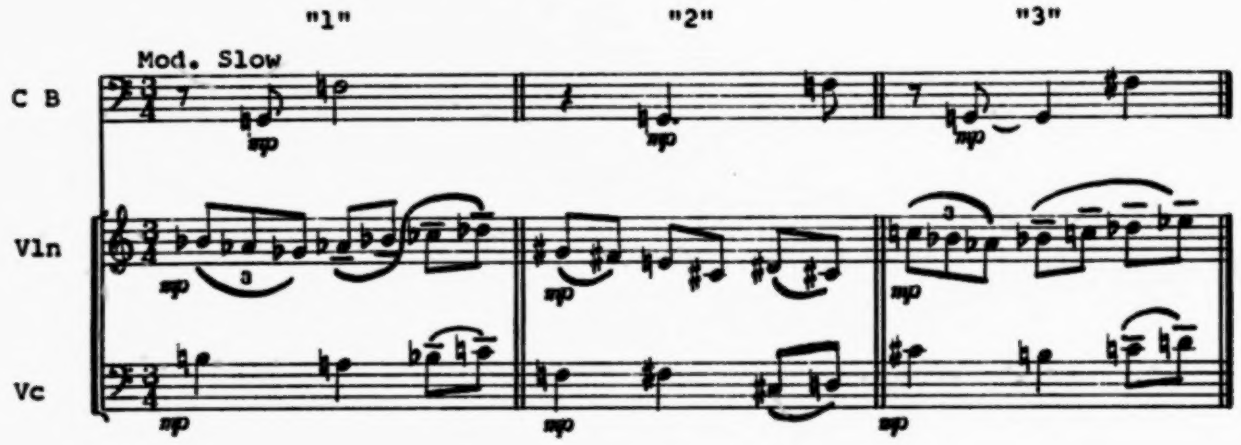
M7 ↑ - ATONAL - MEDIUM RANGE - FOUR OTHER VOICES


"1"
"2"
"3"
Mod. Slow in 3
Vln
B♭Cl
Ob
Vc
Bssn
mp

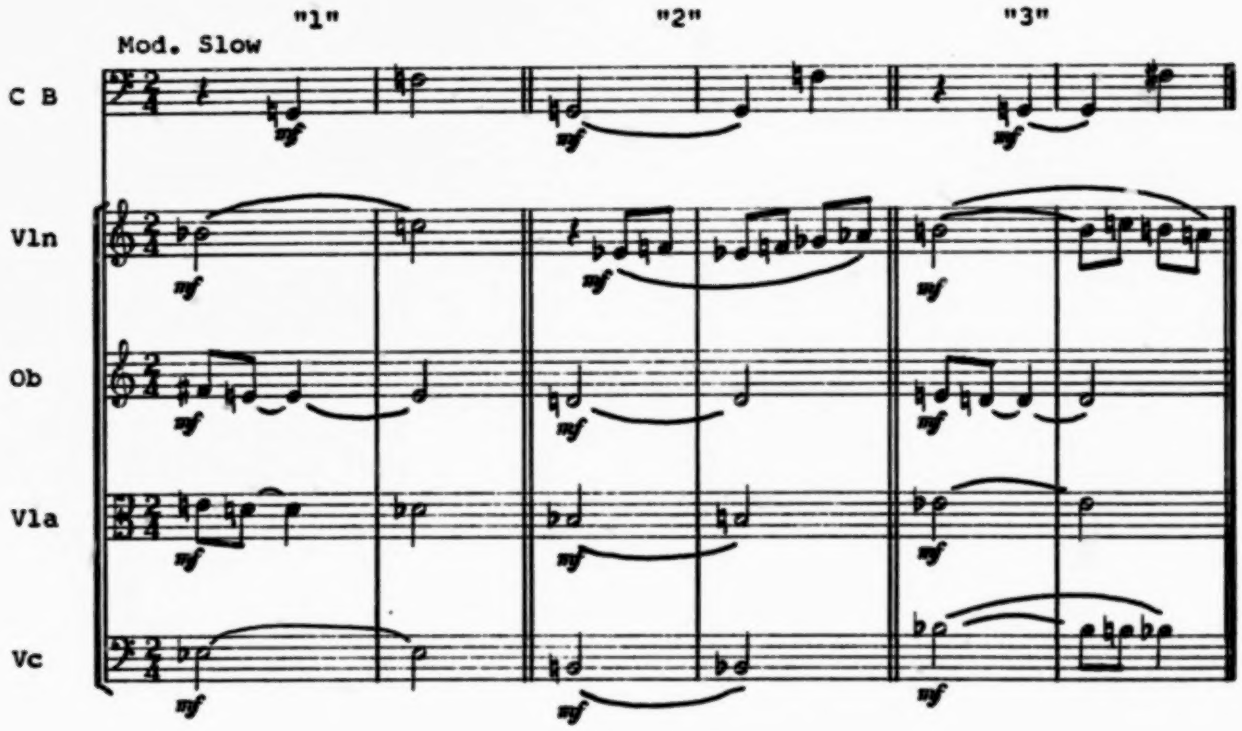
M7 ↑ - ATONAL - LOW RANGE - ONE OTHER VOICE


"1"
"2"
"3"
Mod. Slow
C B
Bssn
mp

M7 ↑ - ATONAL - LOW RANGE - TWO OTHER VOICES

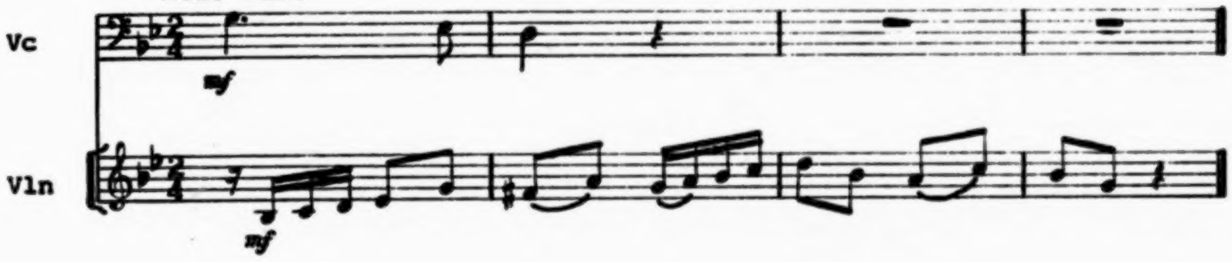

"1"
"2"
"3"
Mod. Slow
C B
Vln
Vc
mp
3

M7 ↑ - ATONAL - LOW RANGE - FOUR OTHER VOICES

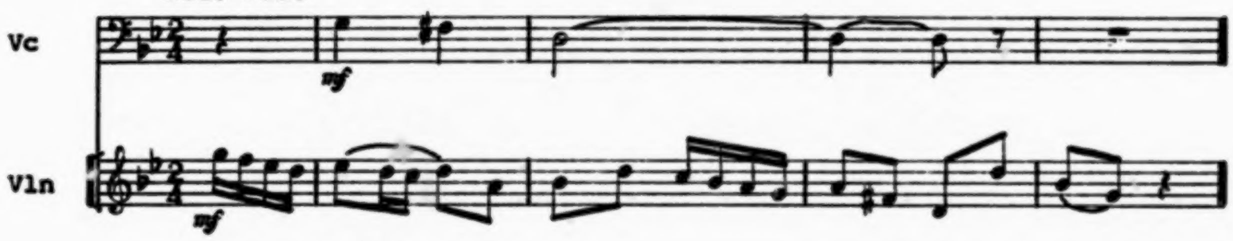

"1"
"2"
"3"
Mod. Slow
C B
Vln
Ob
Vla
Vc
mf

THREE NOTE MELODY - TONAL - LOW RANGE - ONE OTHER VOICE

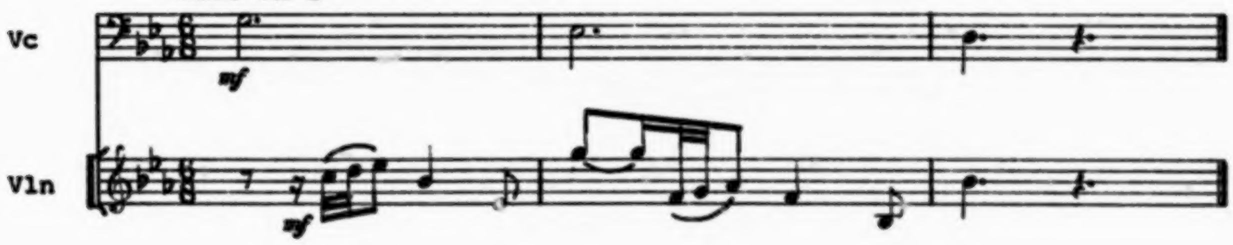
"1"


Mod. Fast
Vc
mf
Vln
mf

"2"

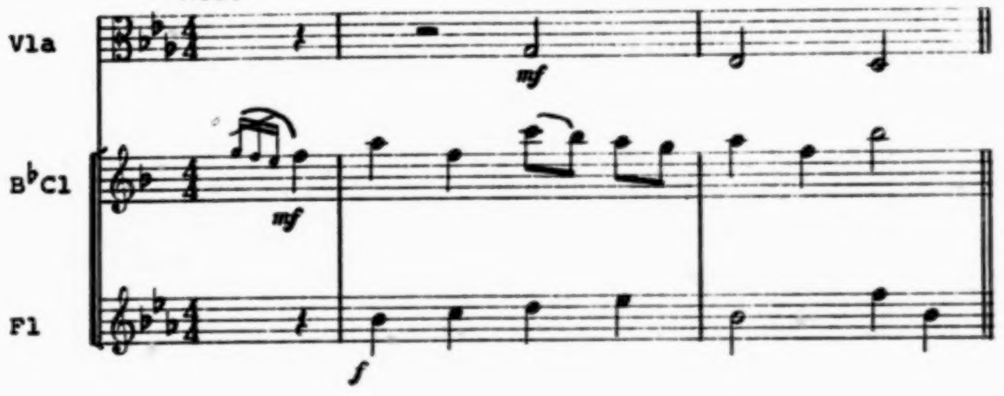

Mod. Fast
Vc
mf
Vln
mf

"3"

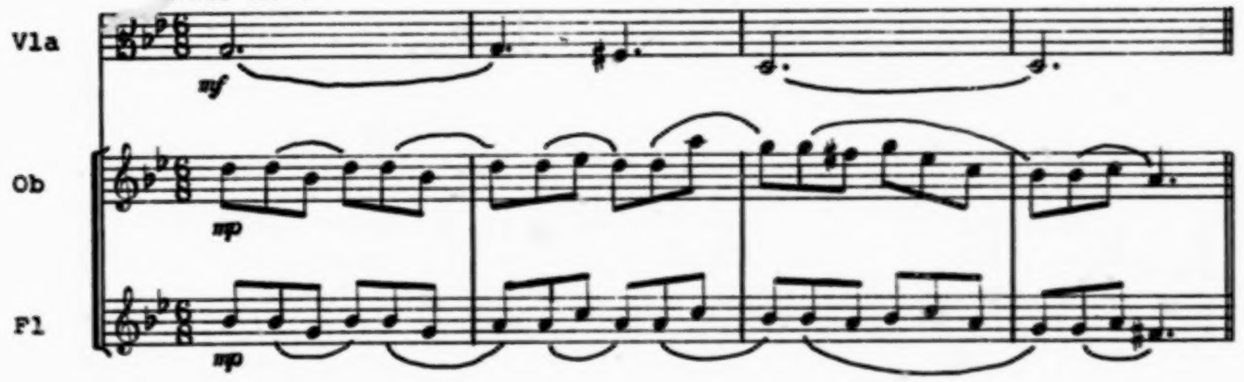

Mod. in 2
Vc
mf
Vln
mf

THREE NOTE MELODY - TONAL - LOW RANGE - TWO OTHER VOICES

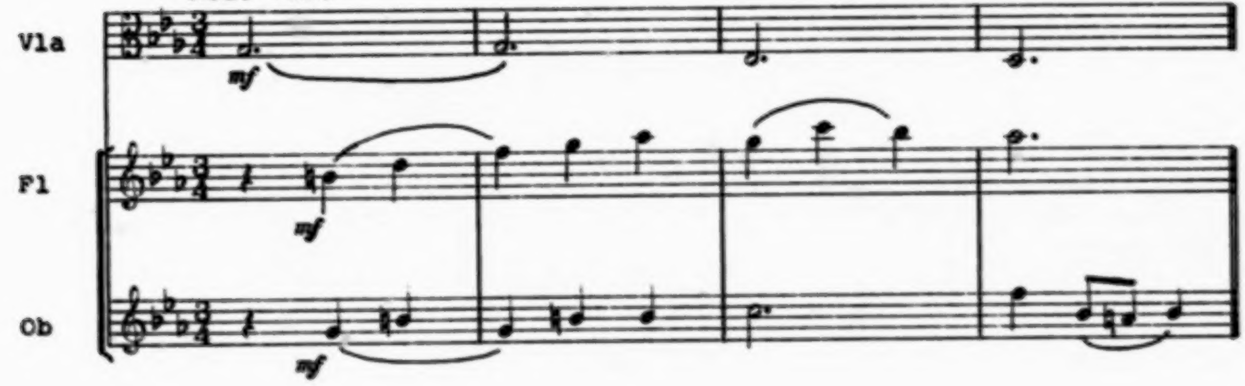
"1"


Mod.
Vla
B♭Cl
Fl
mf
mf
f

"2"

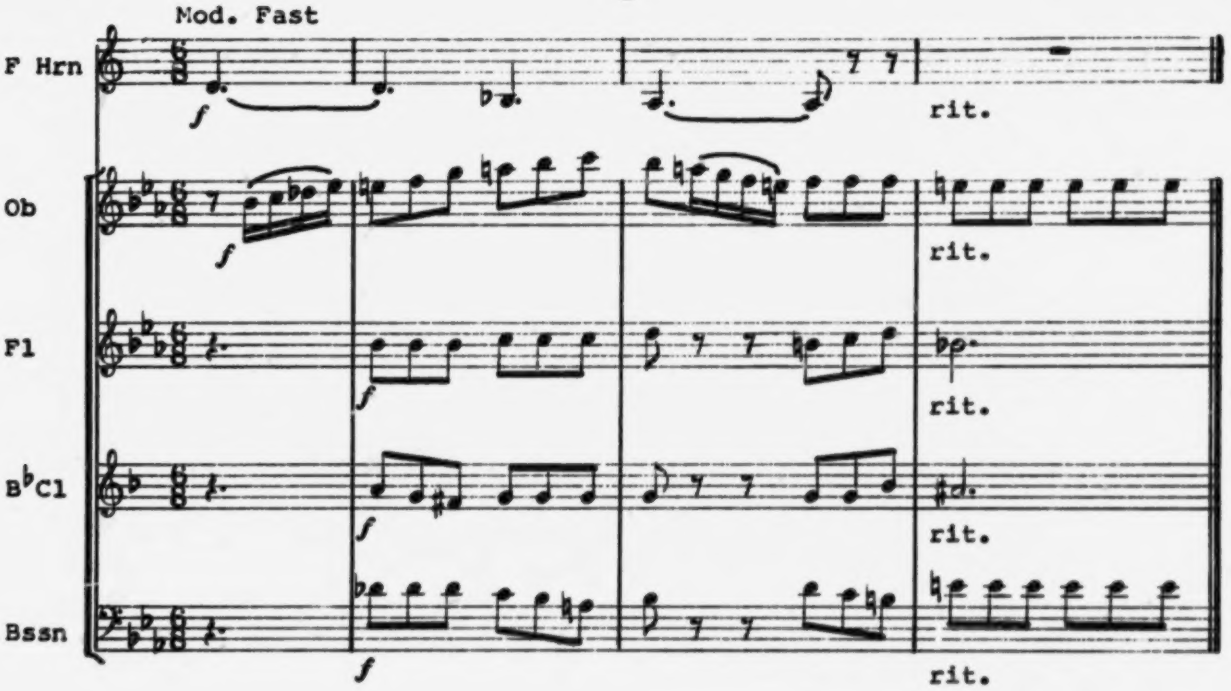

Mod. in 6
Vla
Ob
Fl
mf
mp
mp

"3"

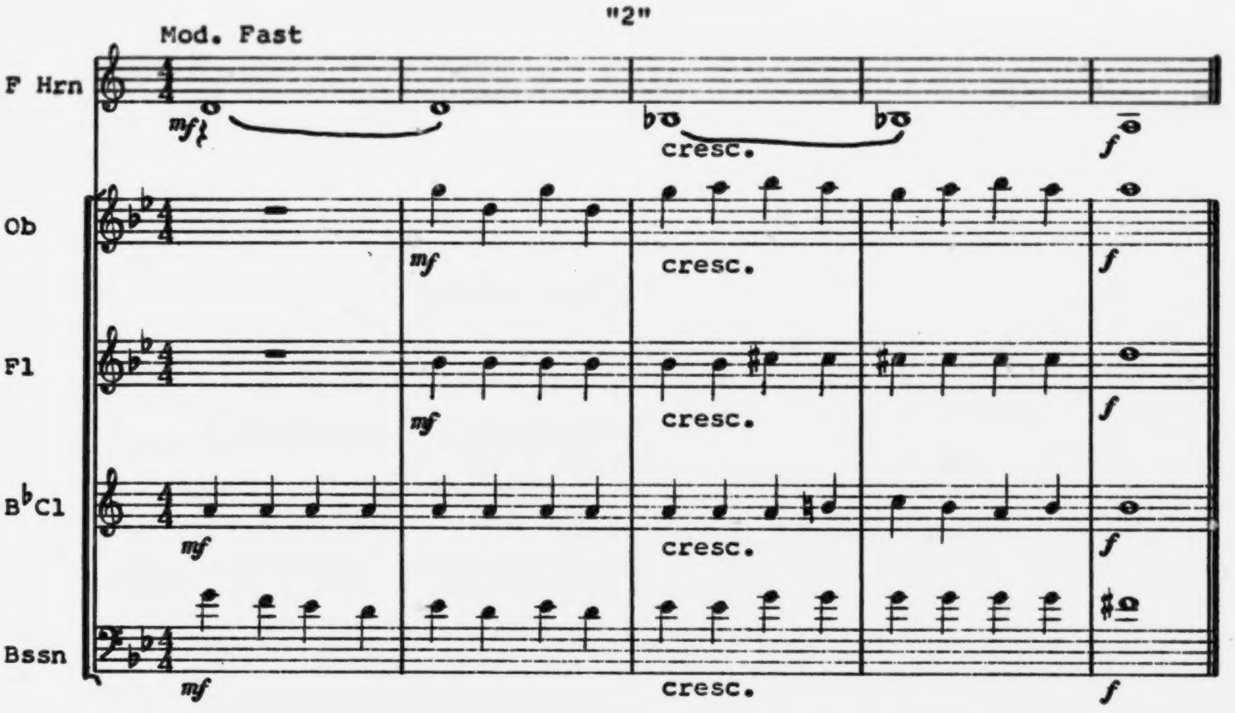

Mod. Fast
Vla
Fl
Ob
mf
mf
mf

THREE NOTE MELODY - TONAL - LOW RANGE - FOUR OTHER VOICES

"1"

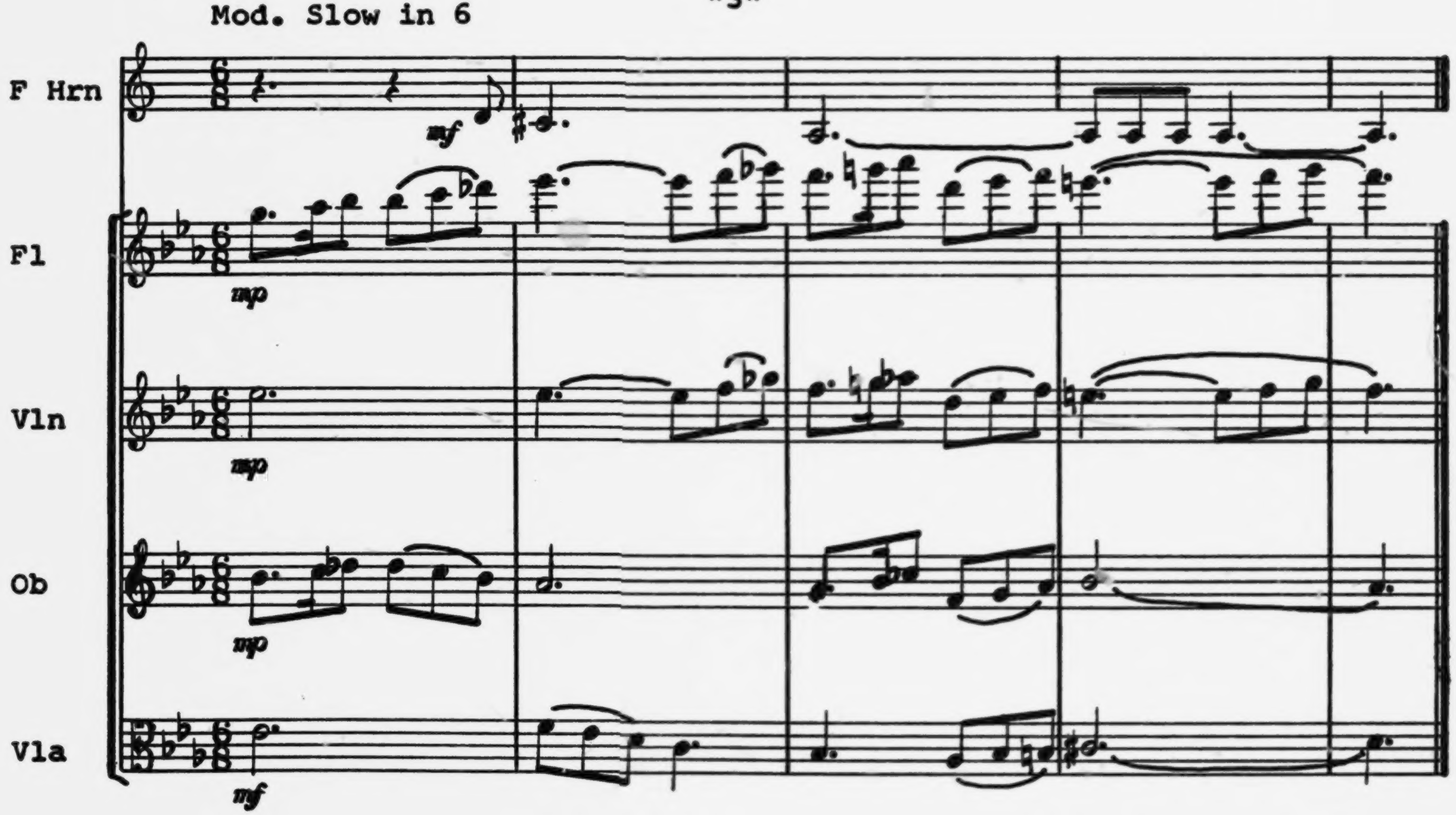

Mod. Fast
F Hrn
Ob
Fl
B♭Cl
Bssn
f
rit.

"2"


Mod. Fast
F Hrn
Ob
Fl
B♭Cl
Bssn
mf
cresc.
f

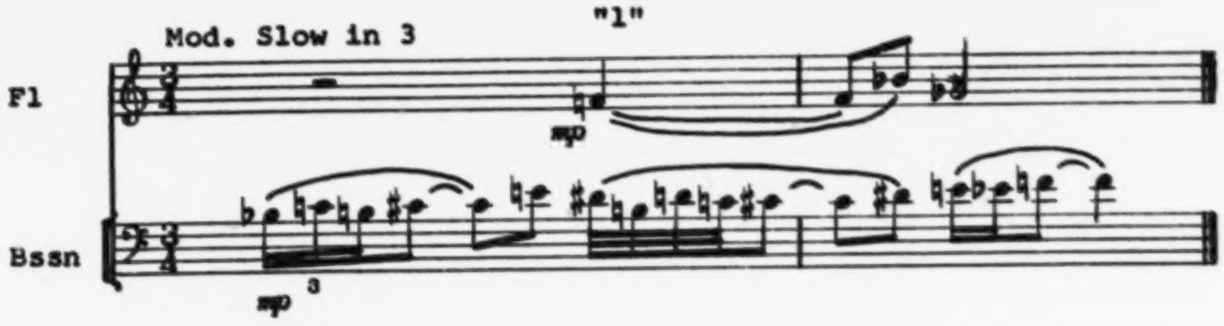
THREE NOTE MELODY - TONAL - LOW RANGE - FOUR OTHER VOICES

"3"

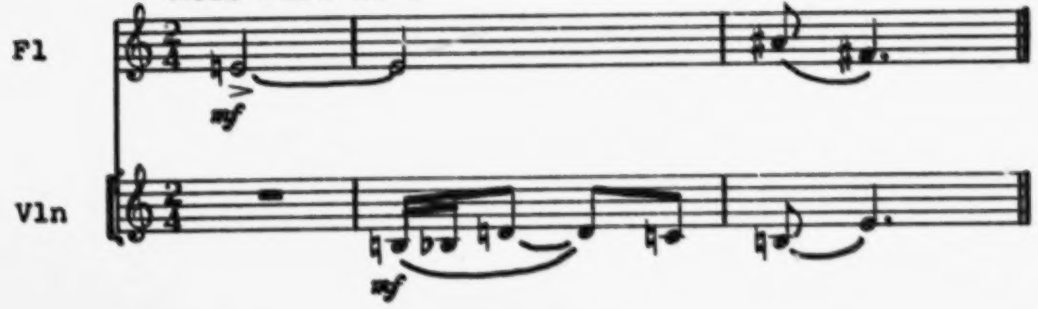

Mod. Slow in 6
F Hrn
Fl
Vln
Ob
Vla
mf
mp
mp
mp
mf

THREE NOTE MELODY - ATONAL - HIGH RANGE - ONE OTHER VOICE

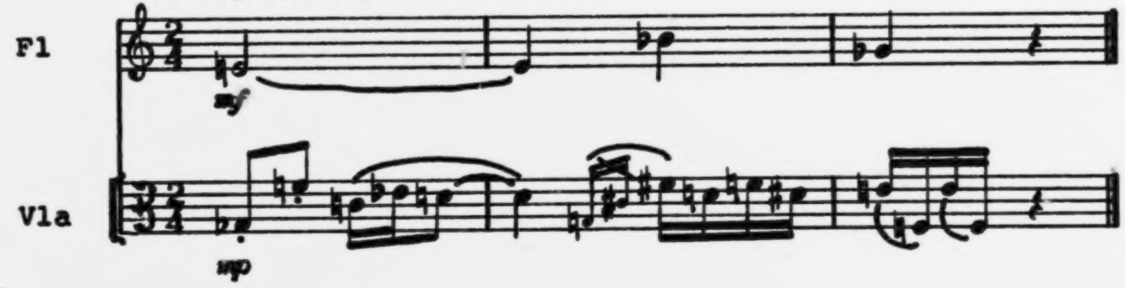
"1"


Mod. Slow in 3
Fl
Bssn
mp
mp
3

"2"

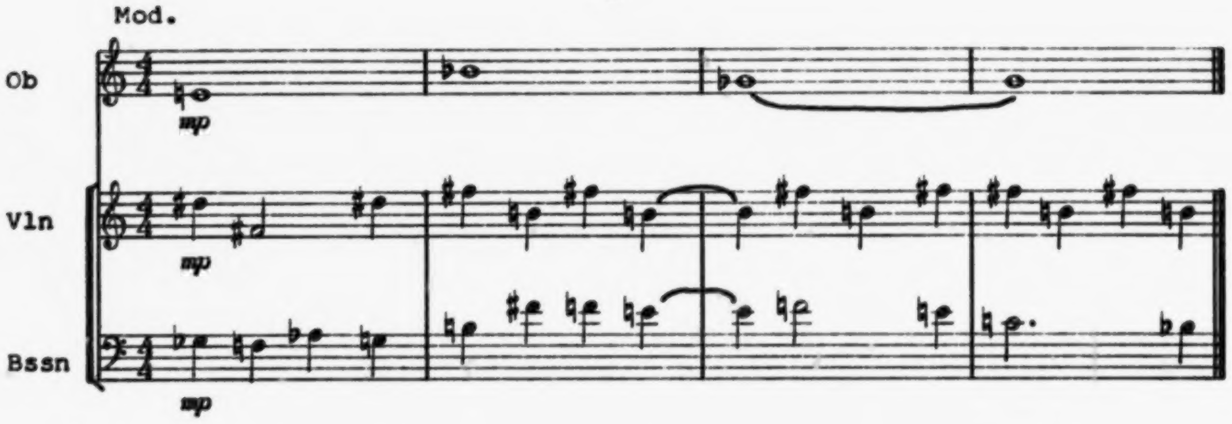

Mod. Fast in 2
Fl
Vln
mf
mf

"3"

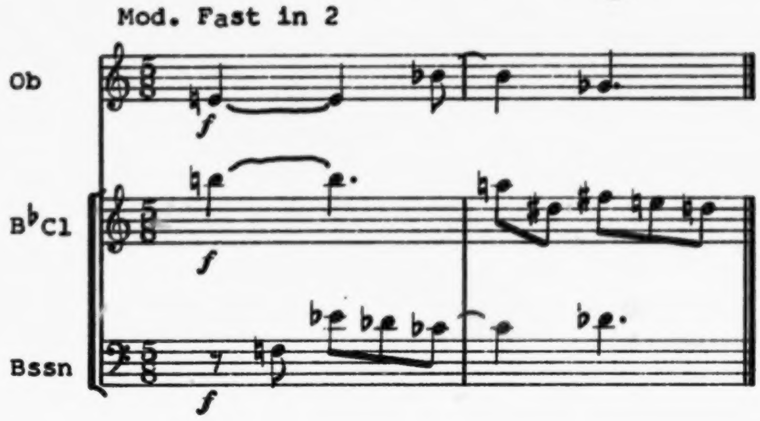

Mod. Fast in 2
Fl
Vla
mf
mp

THREE NOTE MELODY - ATONAL - HIGH RANGE - TWO OTHER VOICES

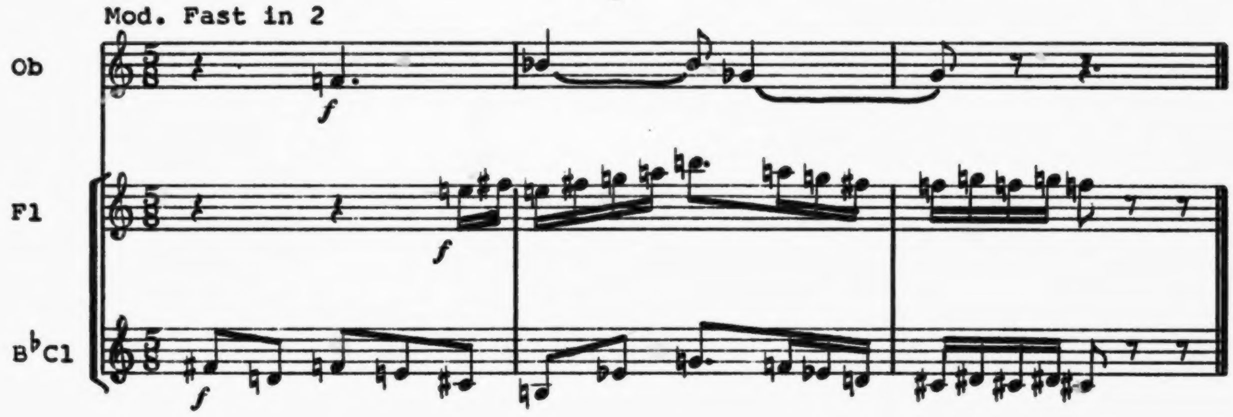
"1"


Mod.
Ob
Vln
Bssn
mp
mp
mp

"2"

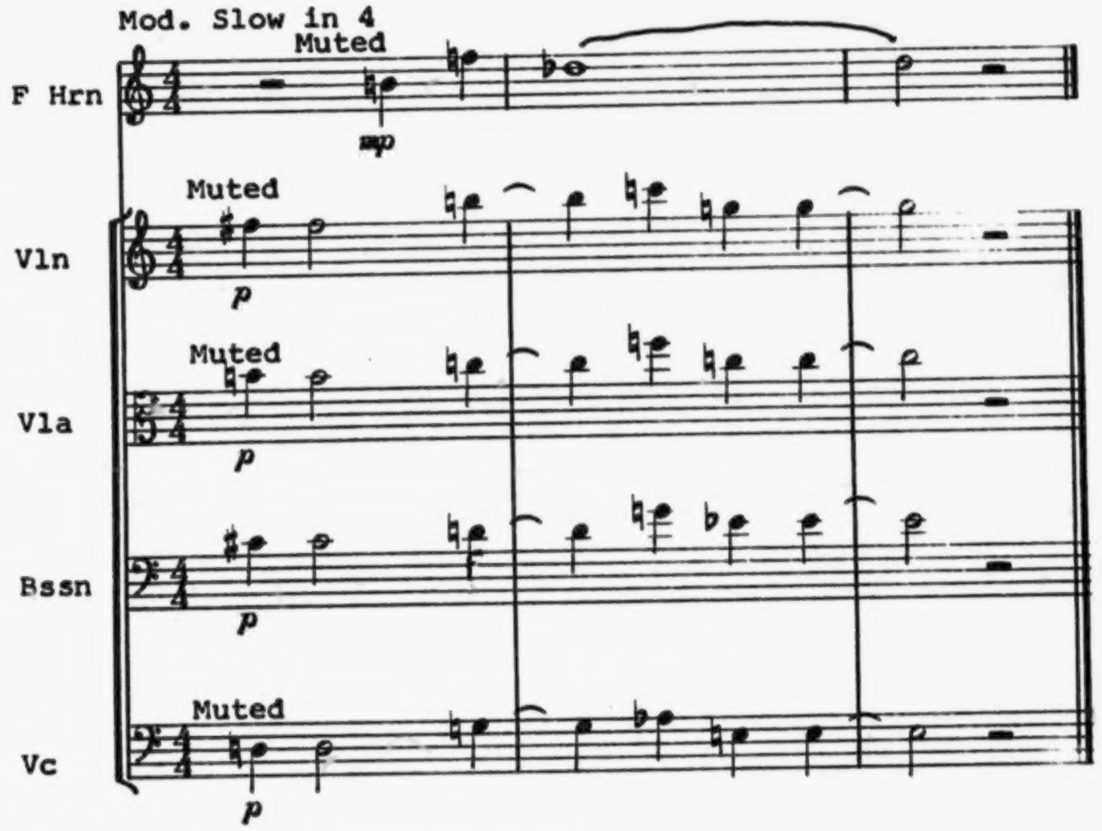

Mod. Fast in 2
Ob
B♭Cl
Bssn
f
f
f

"3"

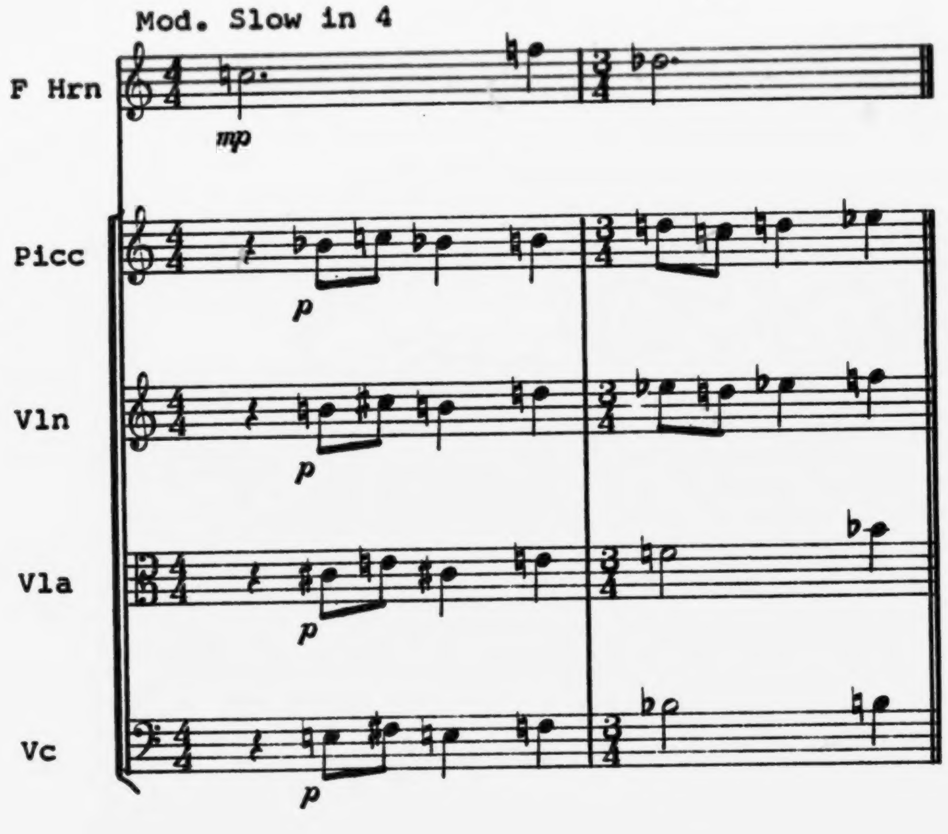

Mod. Fast in 2
Ob
Fl
B♭Cl
f
f
f

THREE NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

"1"

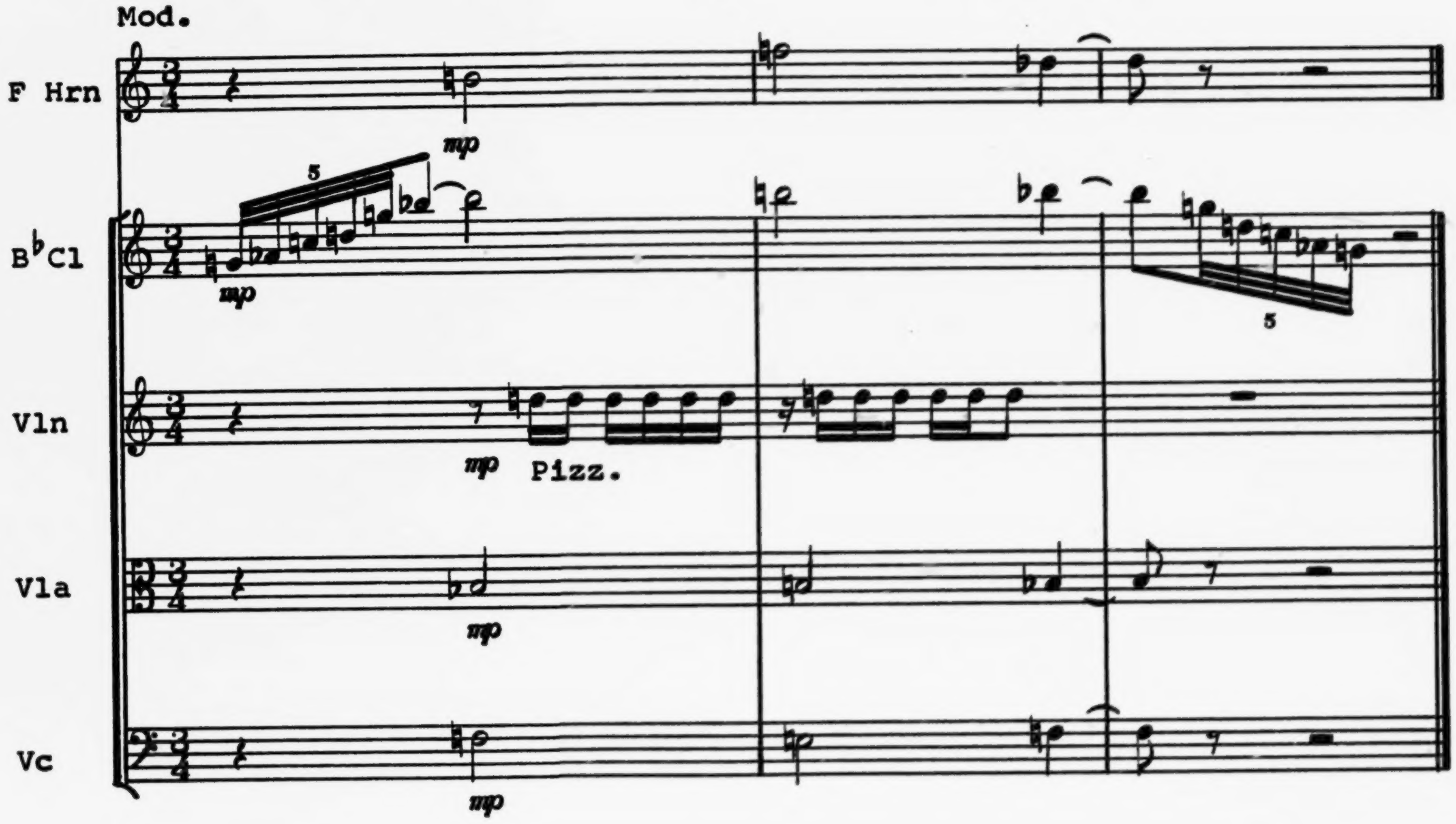

Mod. Slow in 4
Muted
F Hrn
mp
Muted
Vln
p
Muted
Vla
p
Bssn
p
Muted
Vc
p

"2"


Mod. Slow in 4
F Hrn
mp
Picc
p
Vln
p
Vla
p
Vc
p

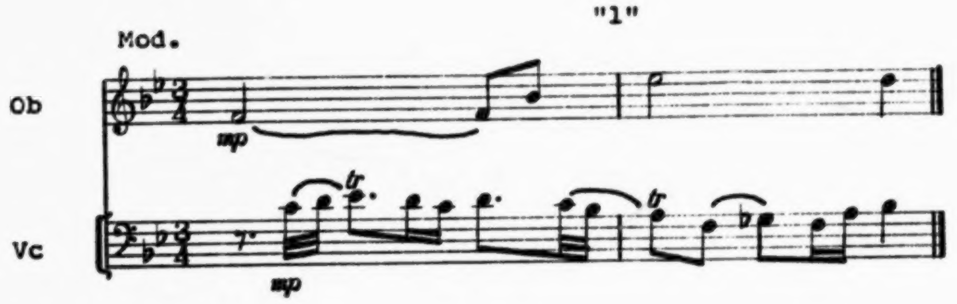
THREE NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

"3"

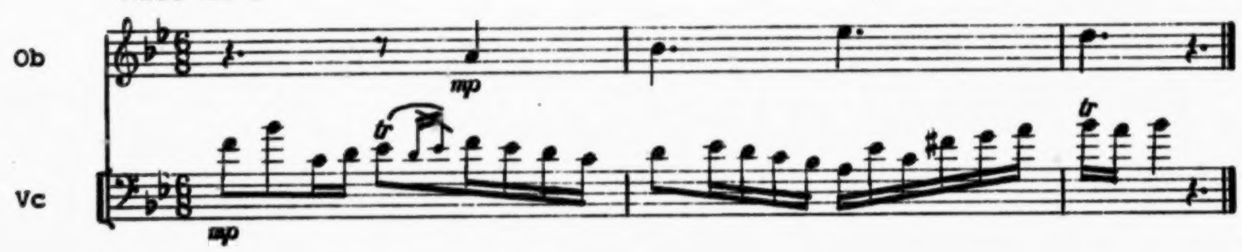

Mod.
F Hrn
B♭Cl
Vln
Vla
Vc
mp
5
Pizz.

FOUR NOTE MELODY - TONAL - HIGH RANGE - ONE OTHER VOICE

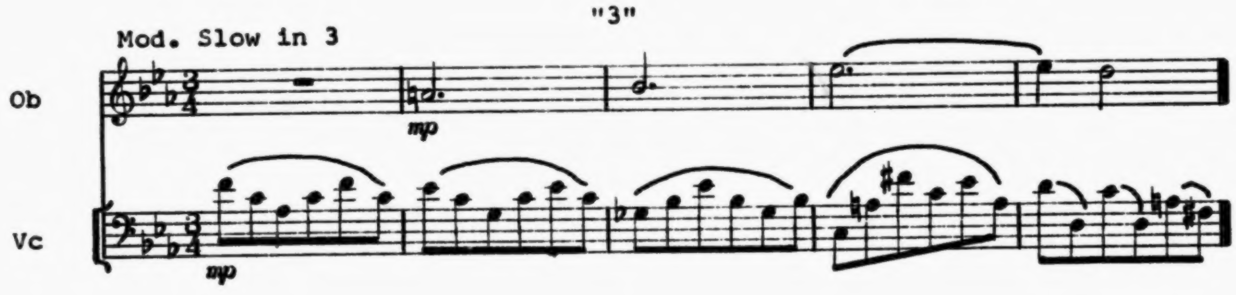
"1"


Mod.
Ob
Vc
mp
mp
tr
tr

"2"

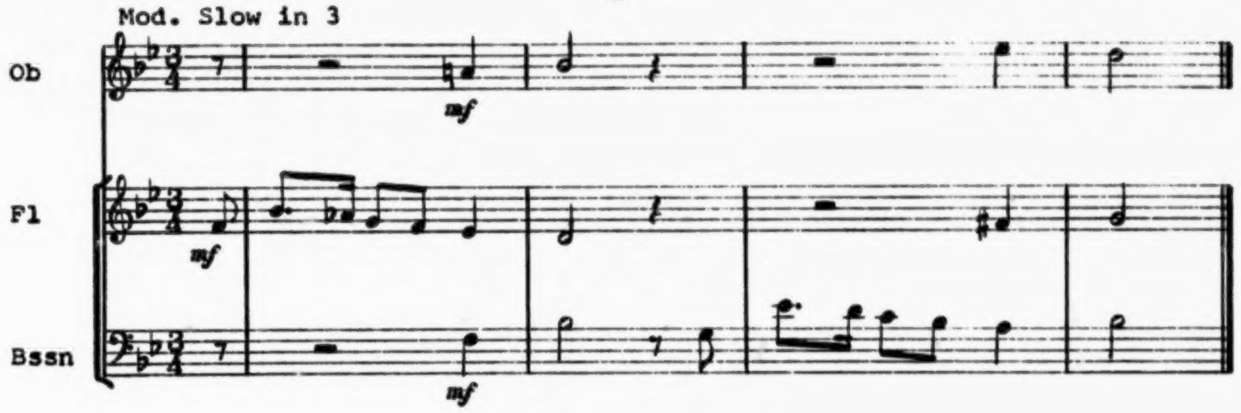

Mod. in 6
Ob
Vc
mp
mp
tr
tr

"3"

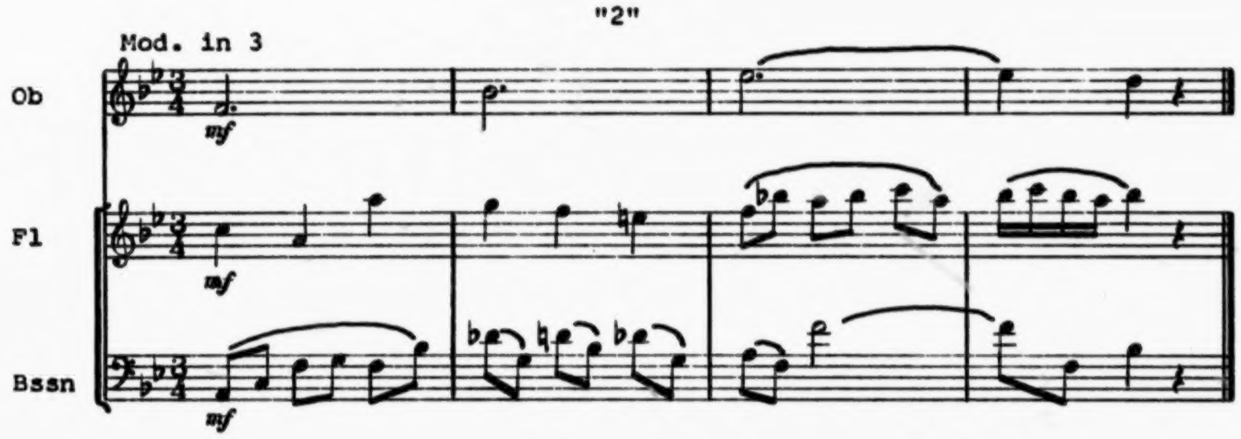

Mod. Slow in 3
Ob
Vc
mp
mp

FOUR NOTE MELODY - TONAL - HIGH RANGE - TWO OTHER VOICES

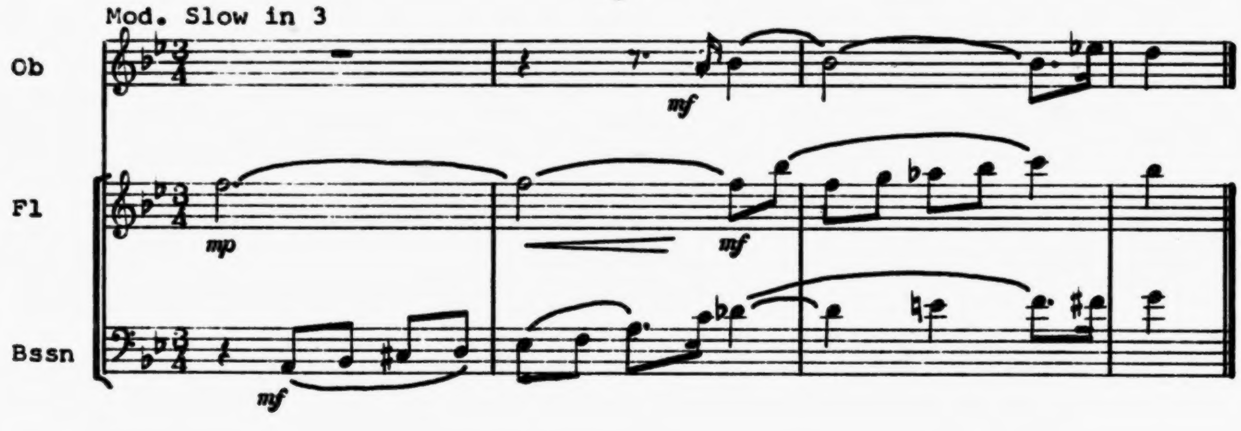
"1"


Mod. Slow in 3
Ob
Fl
Bssn
mf
mf
mf

"2"

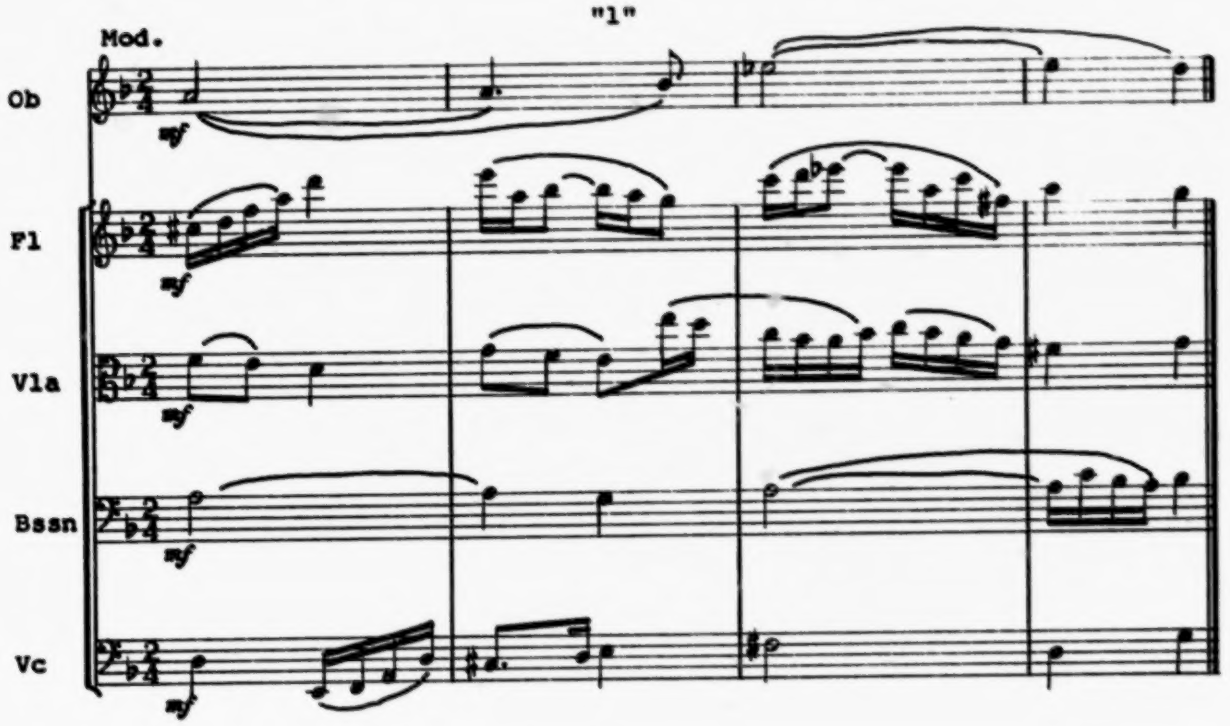

Mod. in 3
Ob
Fl
Bssn
mf
mf
mf

"3"

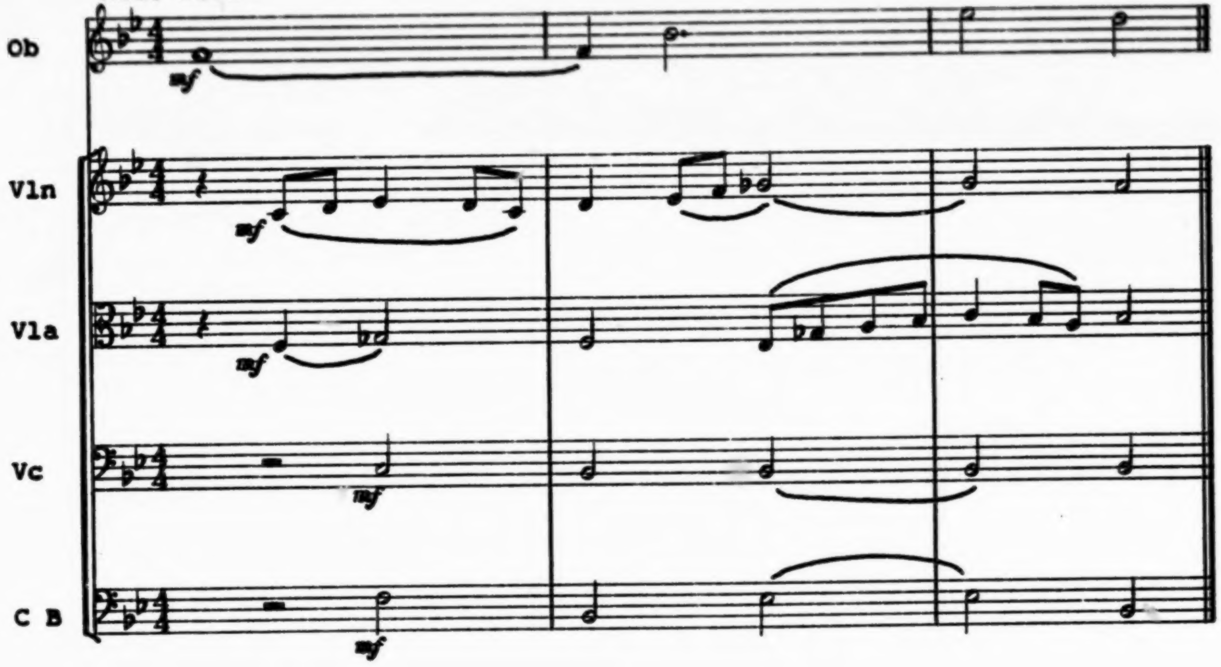

Mod. Slow in 3
Ob
Fl
Bssn
mf
mp
mf
mf

FOUR NOTE MELODY - TONAL - HIGH RANGE - FOUR OTHER VOICES

"1"

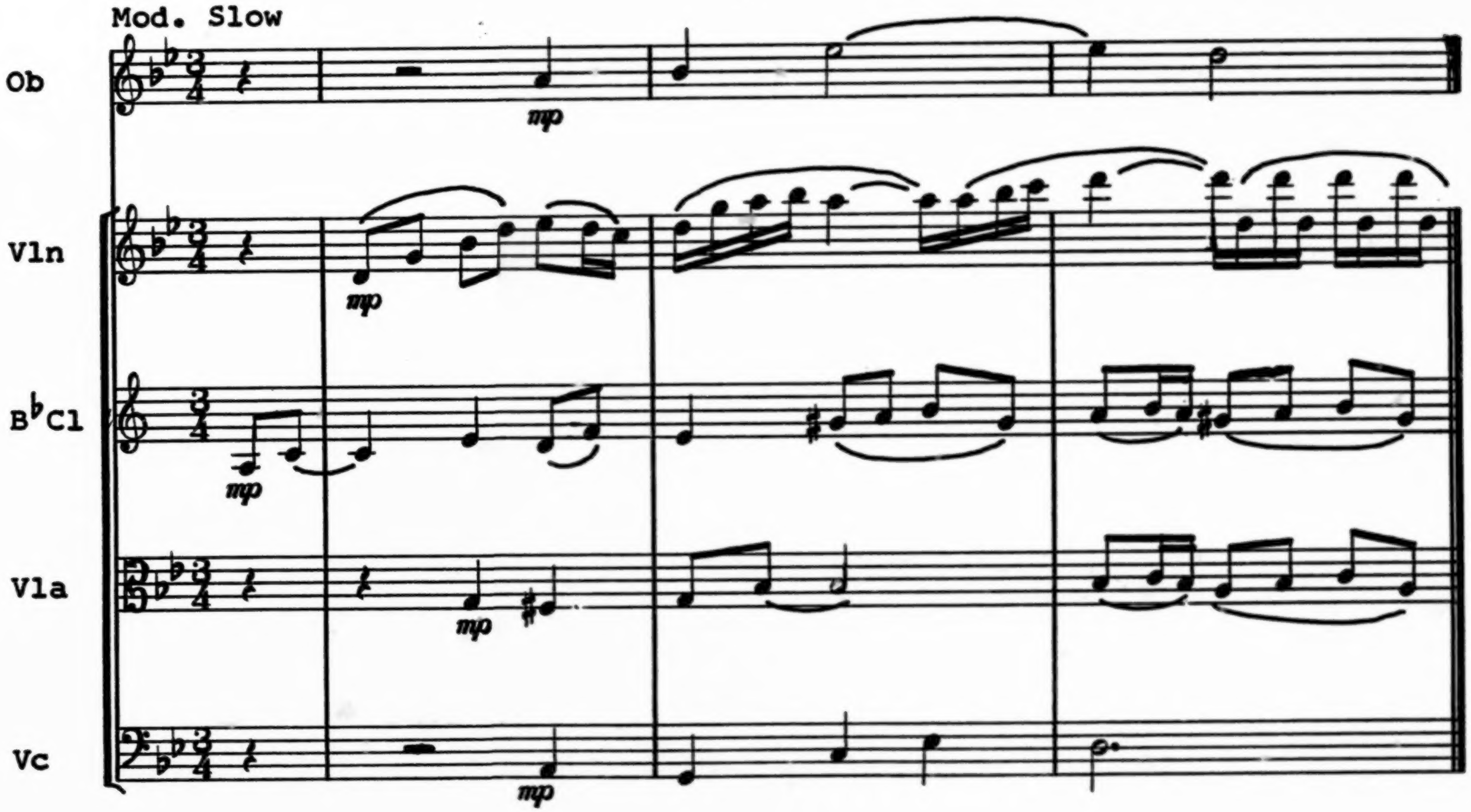

Mod.
Ob
mf
Fl
mf
Vla
mf
Bssn
mf
Vc
mf

"2"


Mod. Slow
Ob
mf
Vln
mf
Vla
mf
Vc
mf
C B
mf

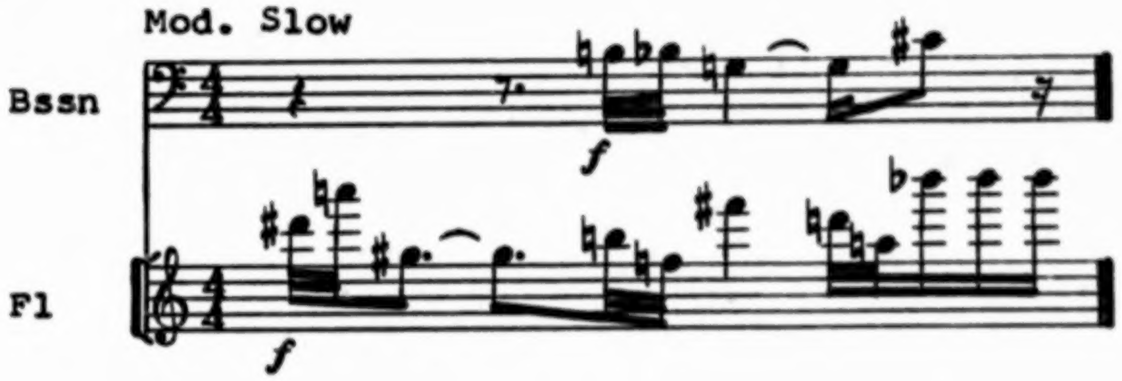
FOUR NOTE MELODY - TONAL - HIGH RANGE - FOUR OTHER VOICES

"3"

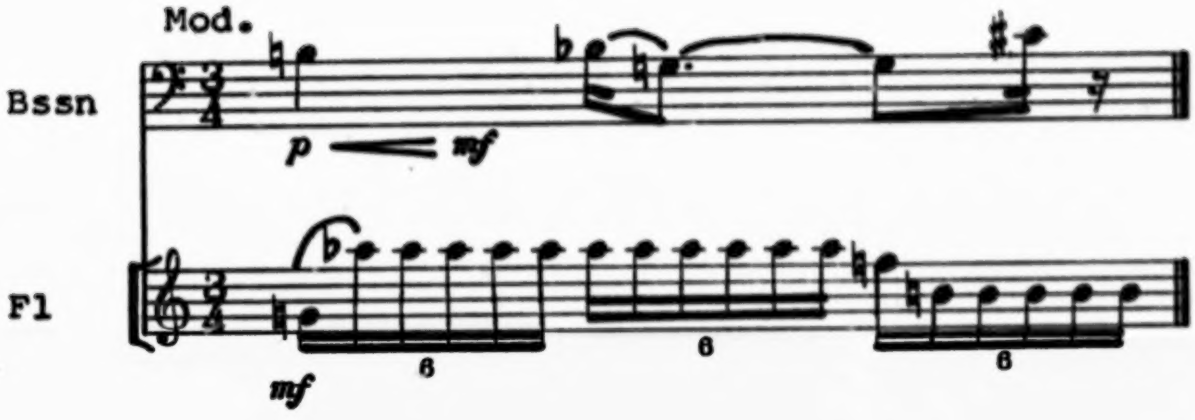

Mod. Slow
Ob
Vln
B♭Cl
Vla
Vc
mp
mp
mp
mp
mp

FOUR NOTE MELODY - ATONAL - LOW RANGE - ONE OTHER VOICE

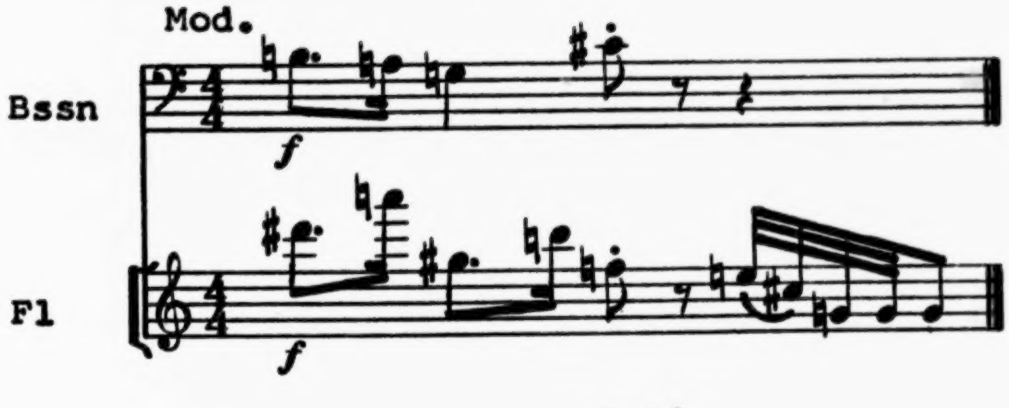
"1"


Mod. Slow
Bssn
f
Fl
f

"2"

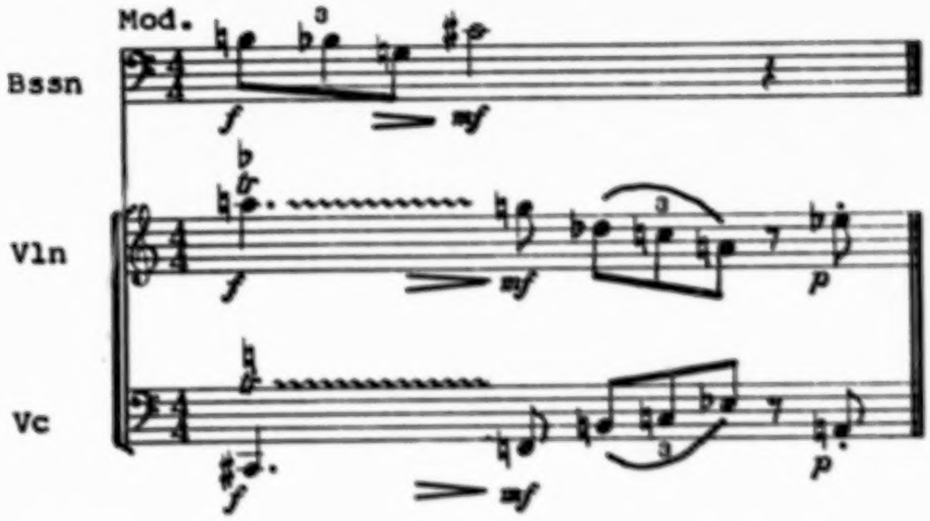

Mod.
Bssn
p
mf
Fl
mf
6
6
6

"3"


Mod.
Bssn
f
Fl
f

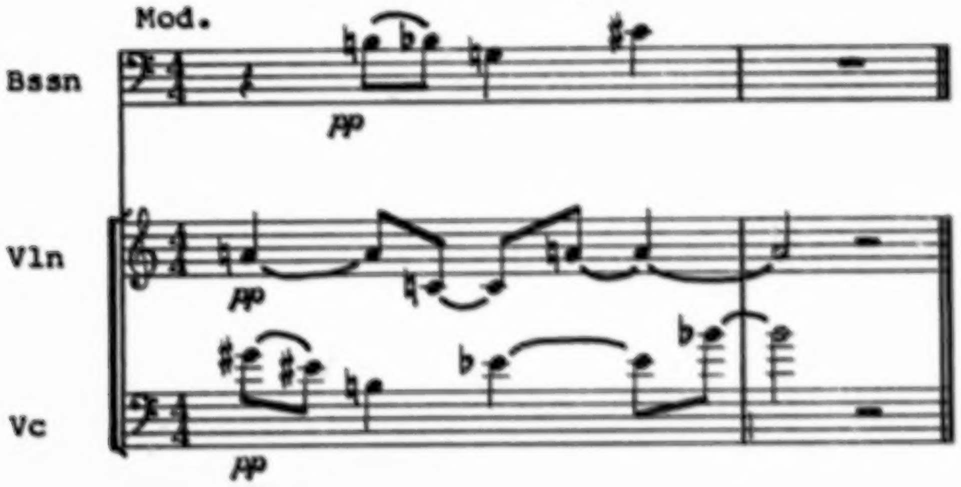
FOUR NOTE MELODY - ATONAL - LOW RANGE - TWO OTHER VOICES

"1"



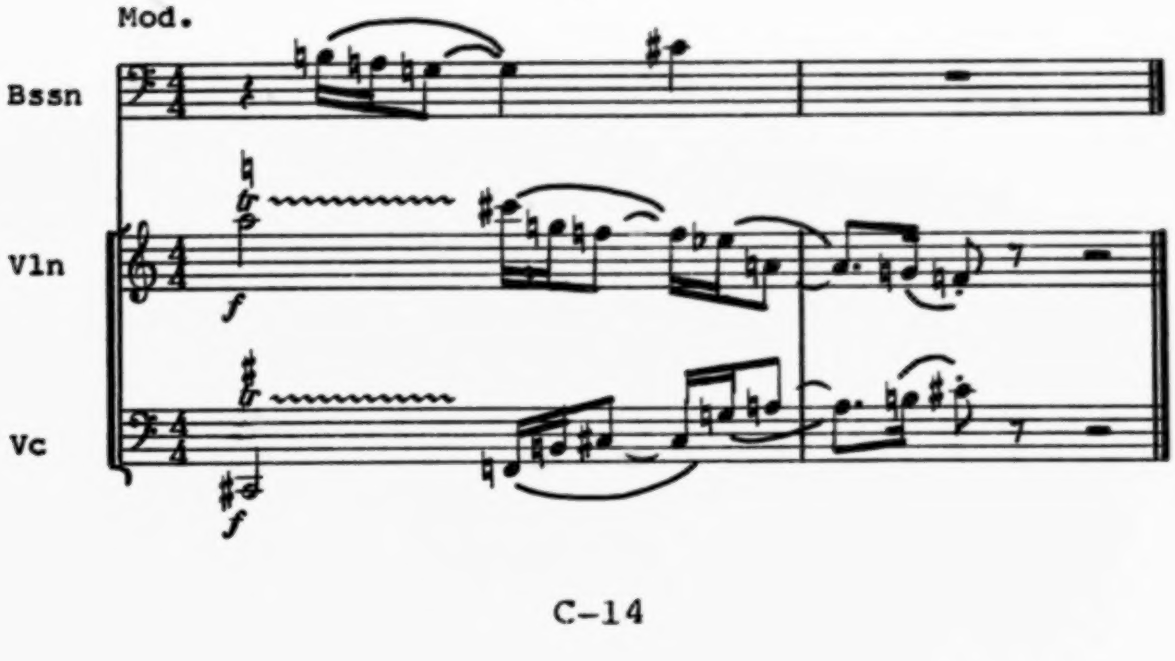
Mod.
Bssn
Vln
Vc
f
mf
p

"2"



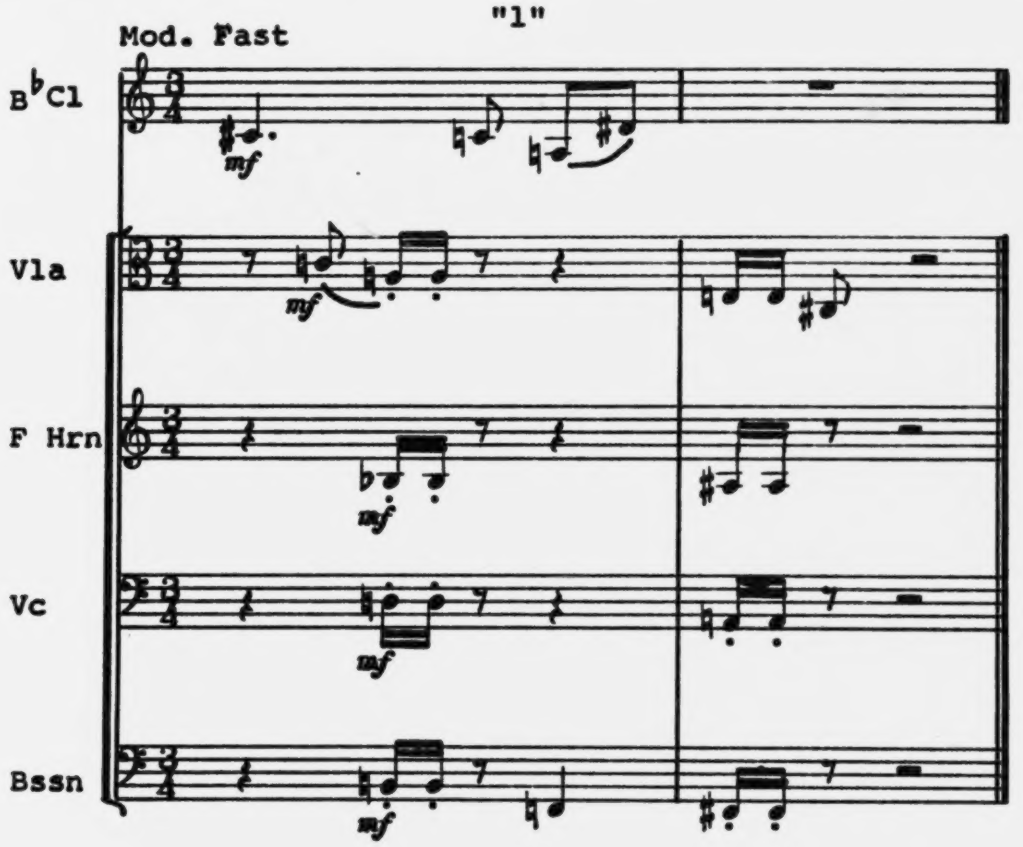
Mod.
Bssn
Vln
Vc
pp

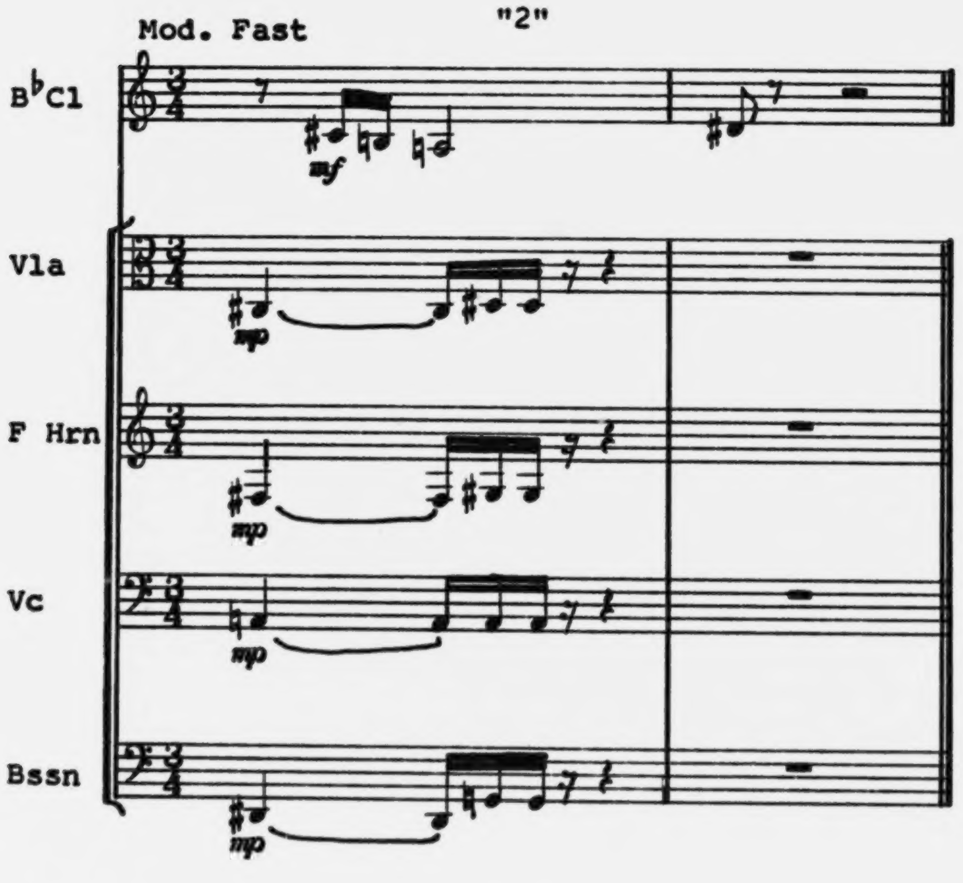
"3"



Mod.
Bssn
Vln
Vc
f

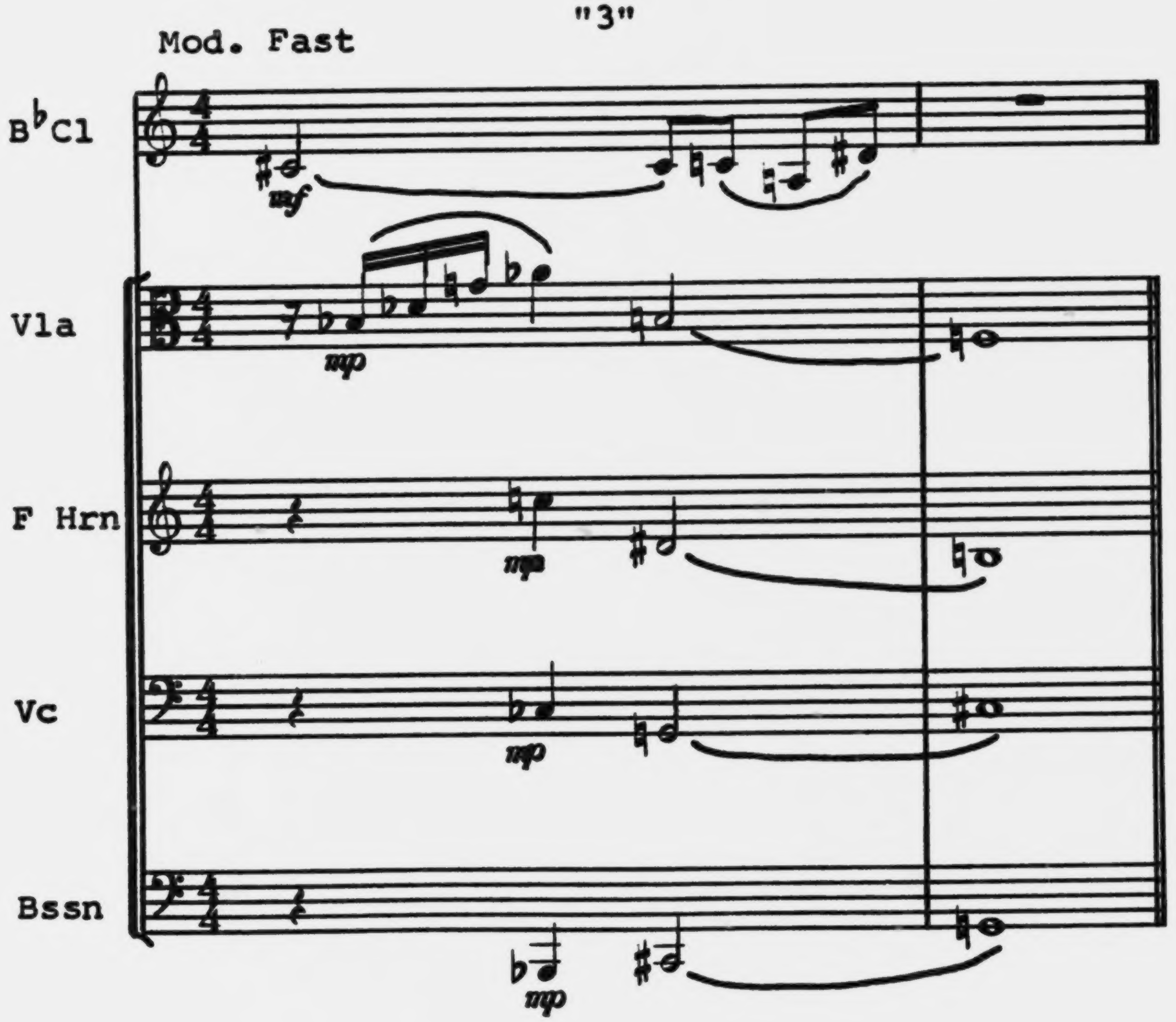
FOUR NOTE MELODY - ATONAL - LOW RANGE - FOUR OTHER VOICES


"1"
Mod. Fast
B♭Cl
Vla
F Hrn
Vc
Bssn
mf


"2"
Mod. Fast
B♭Cl
Vla
F Hrn
Vc
Bssn
mf
mp

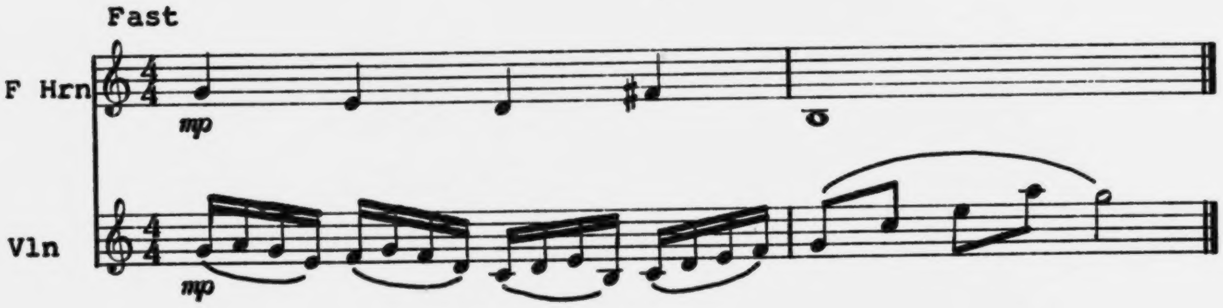
FOUR NOTE MELODY - ATONAL - LOW RANGE - FOUR OTHER VOICES

"3"

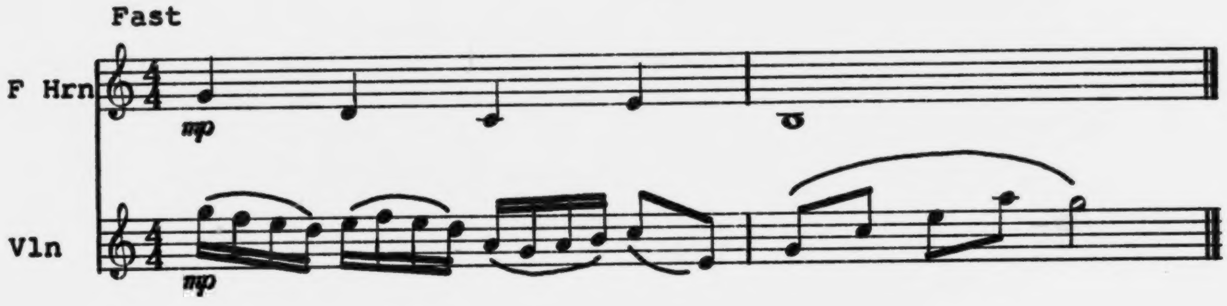

Mod. Fast
B♭Cl
Vla
F Hrn
Vc
Bssn
mf
mp
mp
mp
mp

FIVE NOTE MELODY - TONAL - LOW RANGE - ONE OTHER VOICE

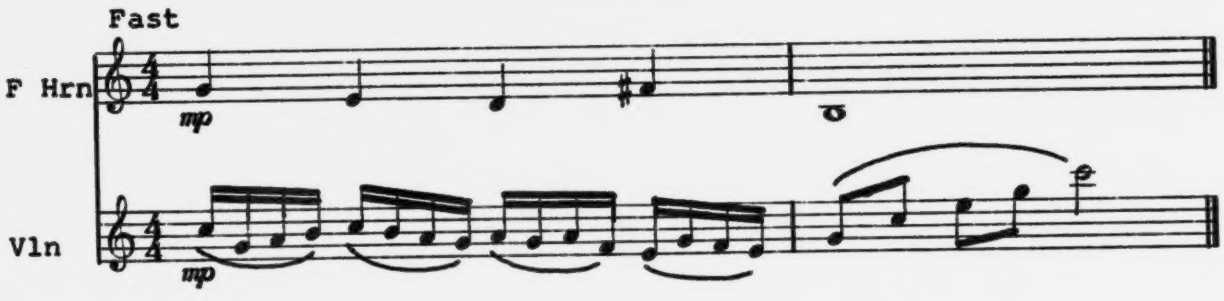
"1"


Fast
F Hrn
mp
Vln
mp

"2"

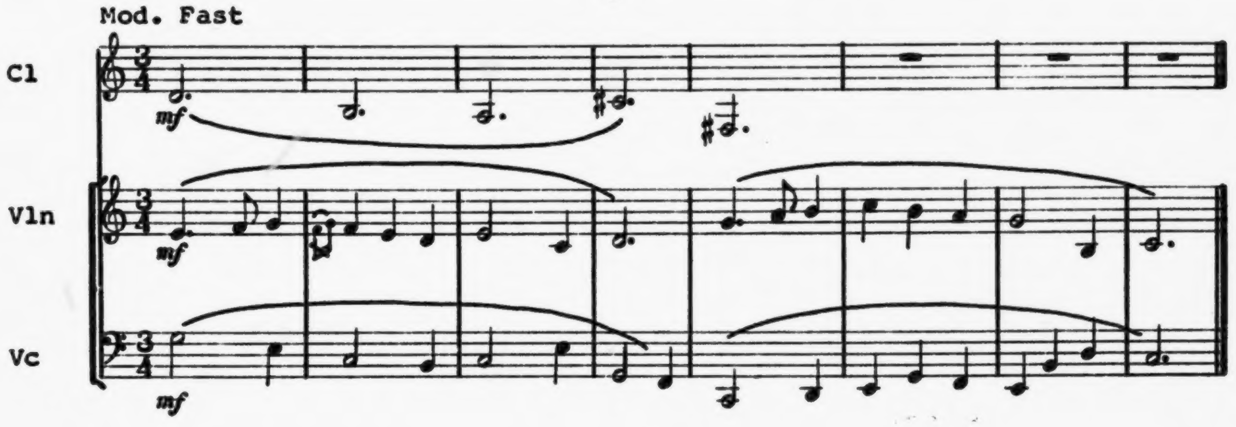

Fast
F Hrn
mp
Vln
mp

"3"

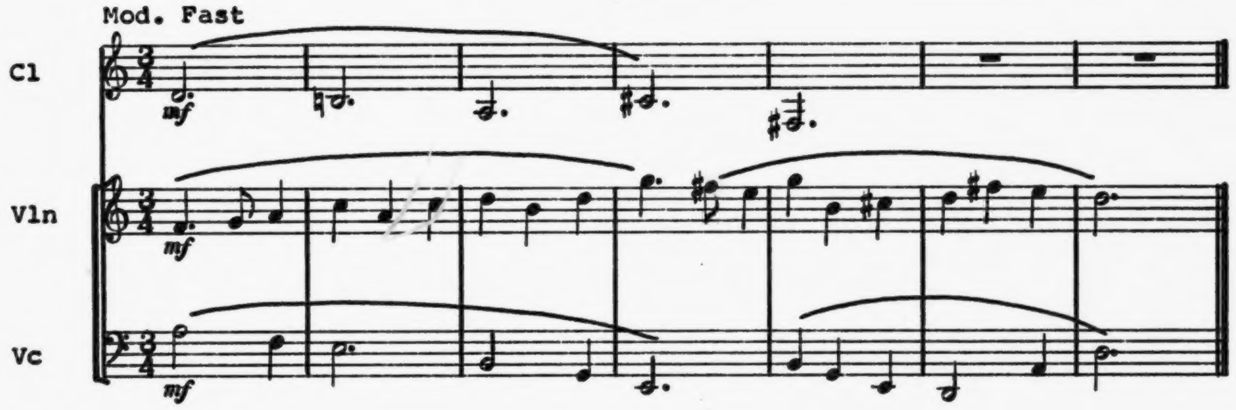

Fast
F Hrn
mp
Vln
mp

FIVE NOTE MELODY - TONAL - LOW RANGE - TWO OTHER VOICES

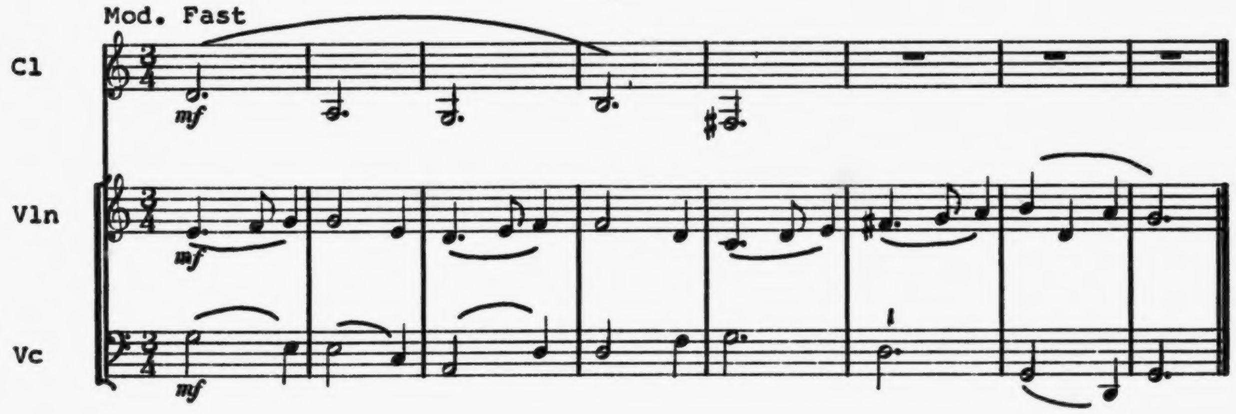
"1"


Mod. Fast
Cl
Vln
Vc
mf
mf
mf

"2"

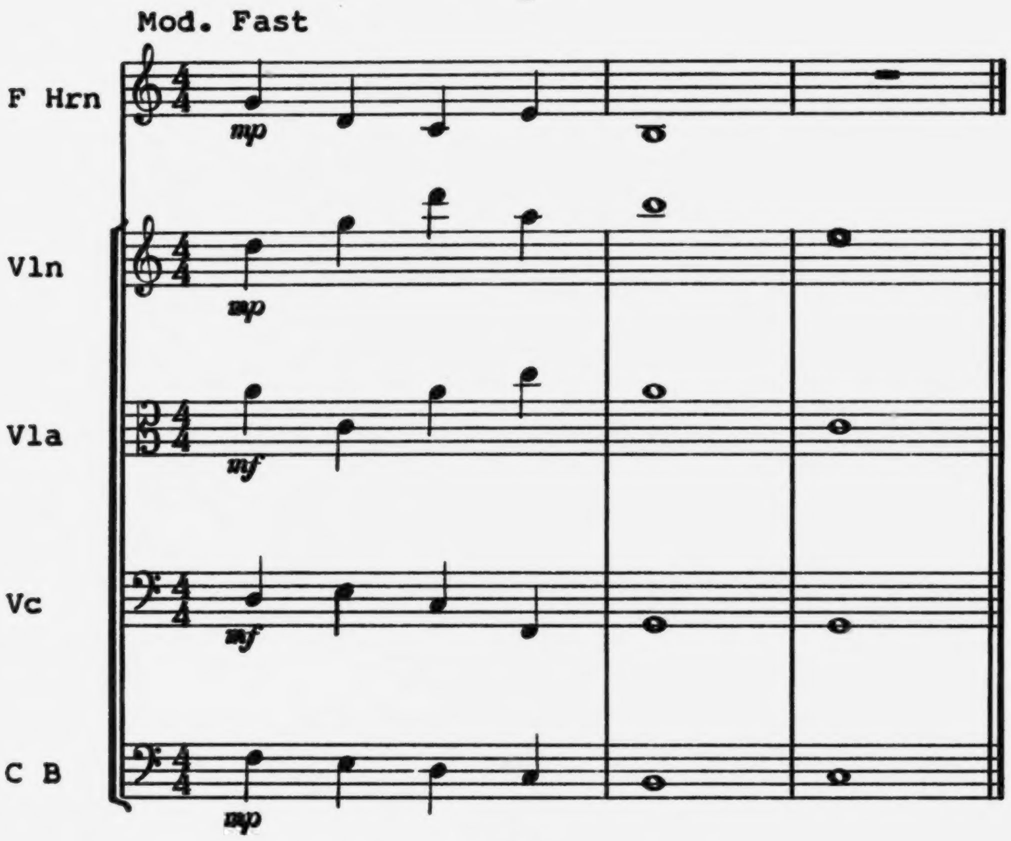

Mod. Fast
Cl
Vln
Vc
mf
mf
mf

"3"

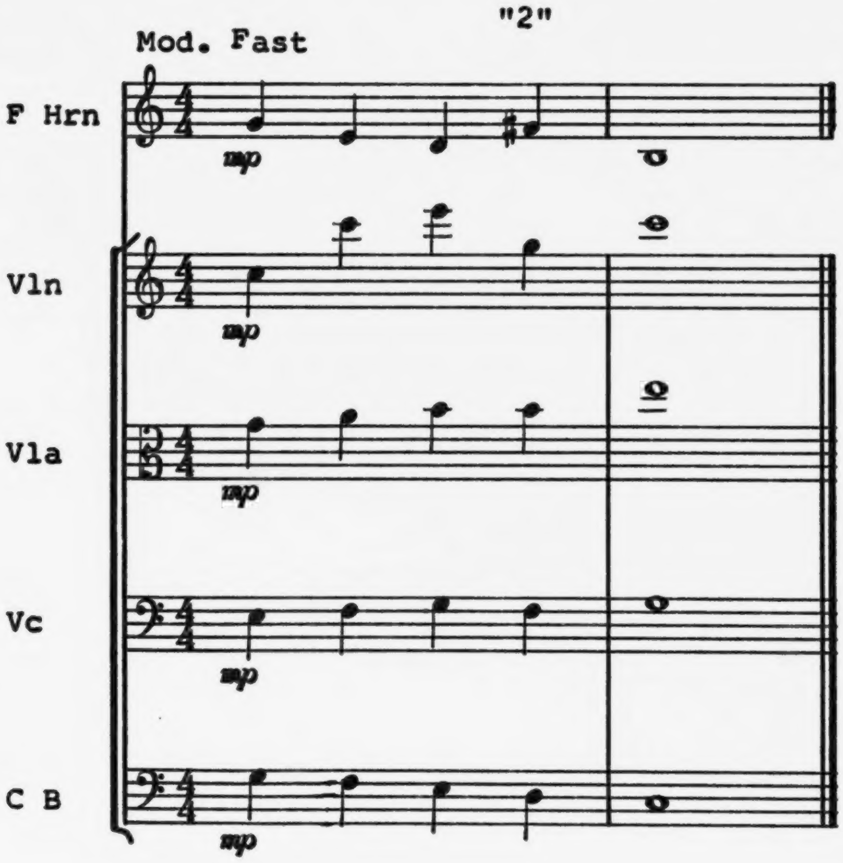

Mod. Fast
Cl
Vln
Vc
mf
mf
mf

FIVE NOTE MELODY - TONAL - LOW RANGE - FOUR OTHER VOICES

"1"

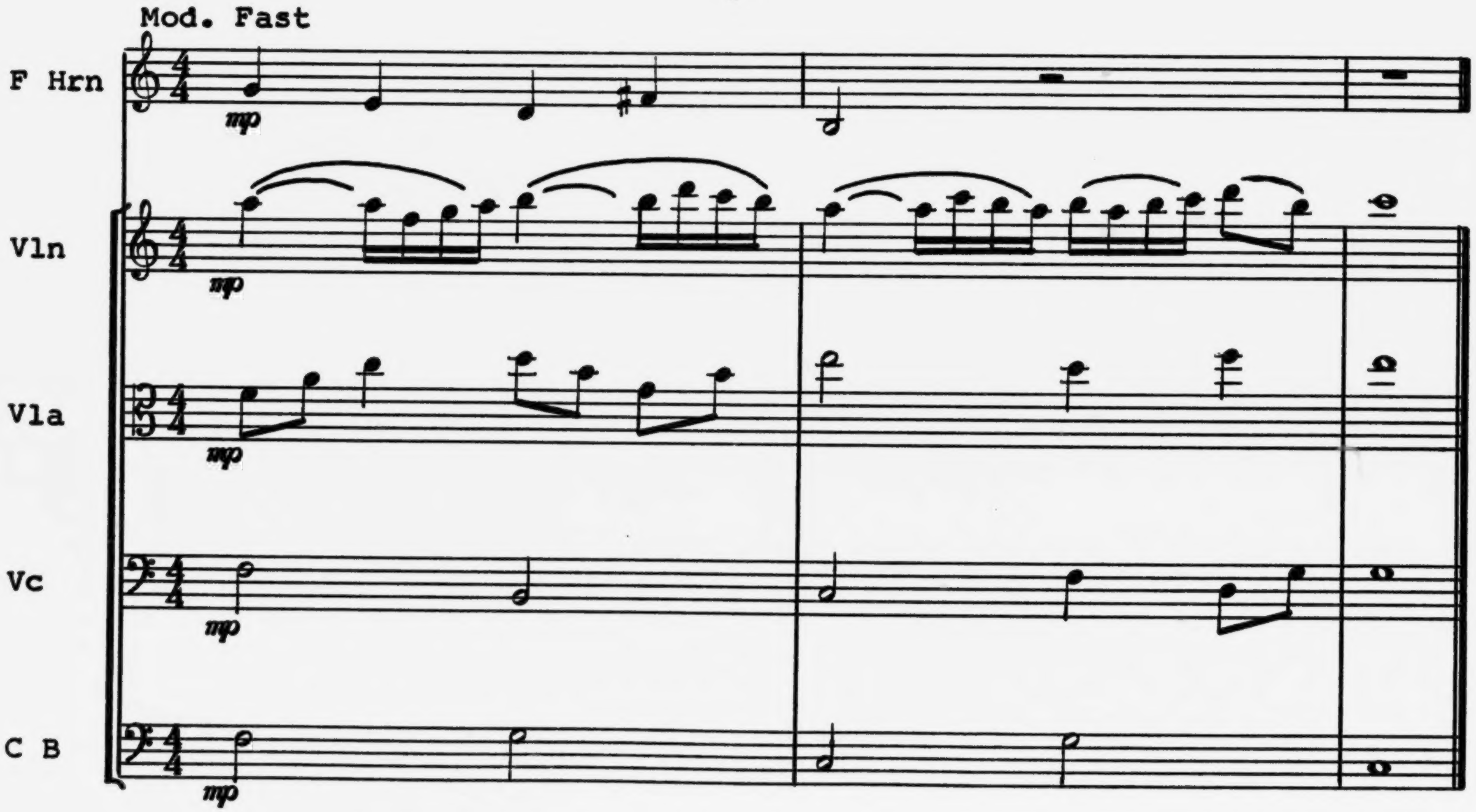

Mod. Fast
F Hrn
Vln
Vla
Vc
C B
mp
mp
mf
mf
mp

"2"


Mod. Fast
F Hrn
Vln
Vla
Vc
C B
mp
mp
mp
mp
mp

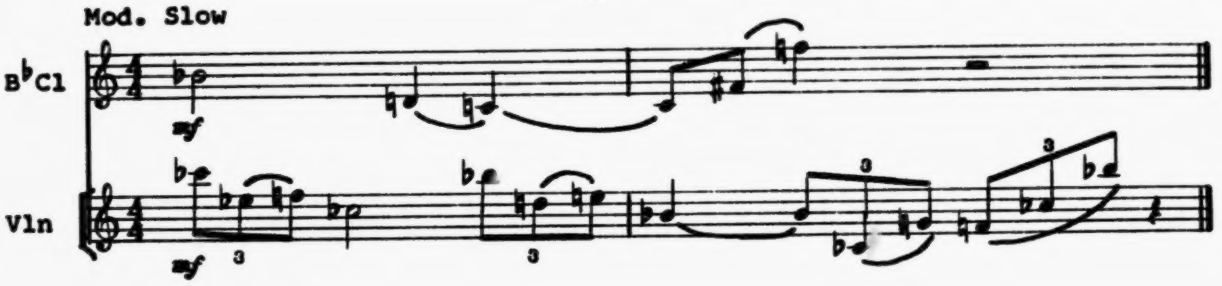
FIVE NOTE MELODY - TONAL - LOW RANGE - FOUR OTHER VOICES

"3"

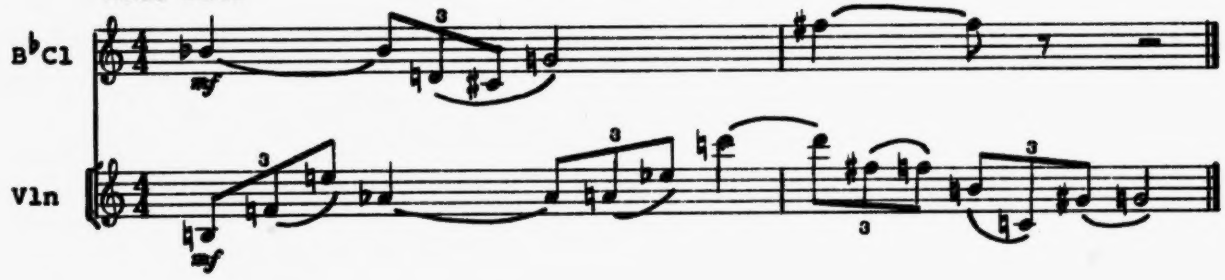

Mod. Fast
F Hrn
Vln
Vla
Vc
C B
mp
mp
mp
mp
mp

FIVE NOTE MELODY - ATONAL - HIGH RANGE - ONE OTHER VOICE

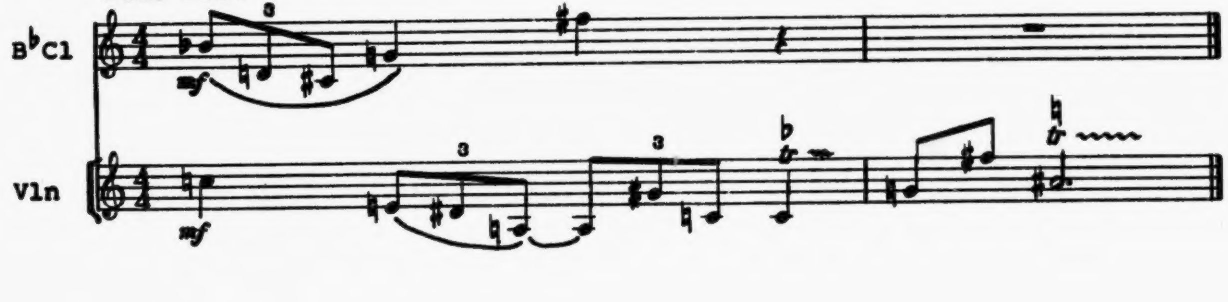
"1"


Mod. Slow
B♭Cl
Vln
mf
3

"2"

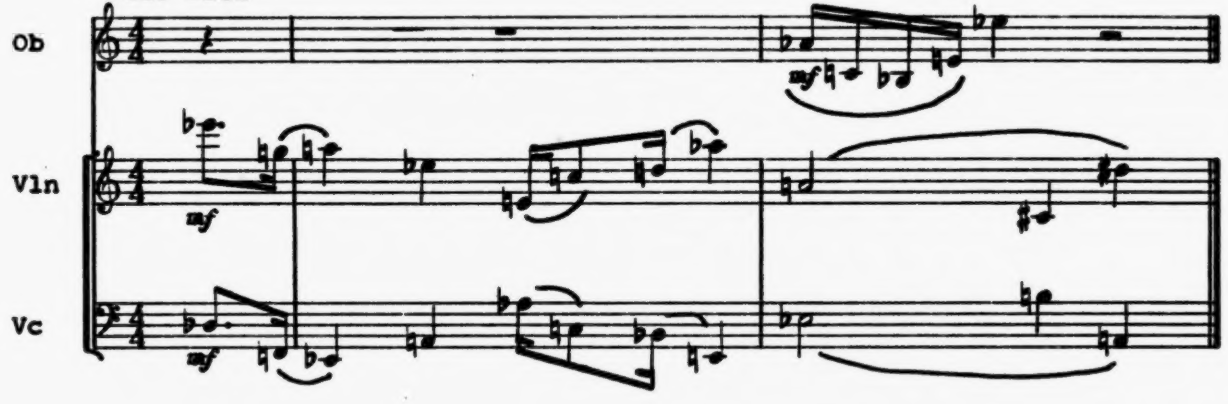

Mod. Slow
B♭Cl
Vln
mf
3

"3"

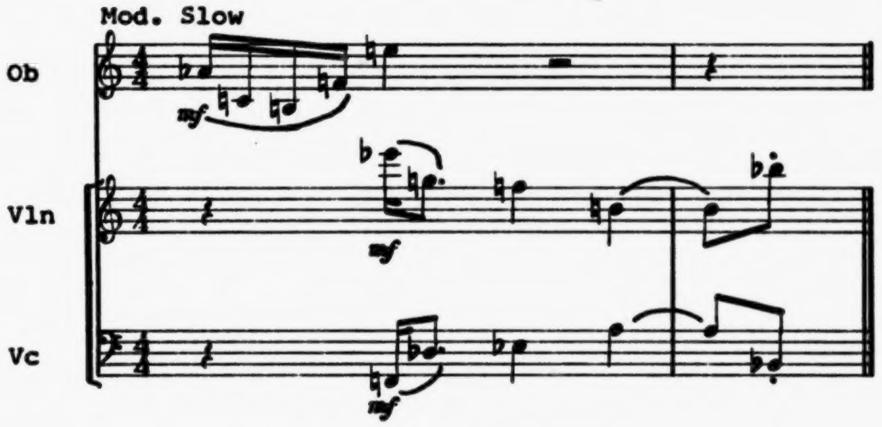

Mod. Slow
B♭Cl
Vln
mf
3
tr

FIVE NOTE MELODY - ATONAL - HIGH RANGE - TWO OTHER VOICES

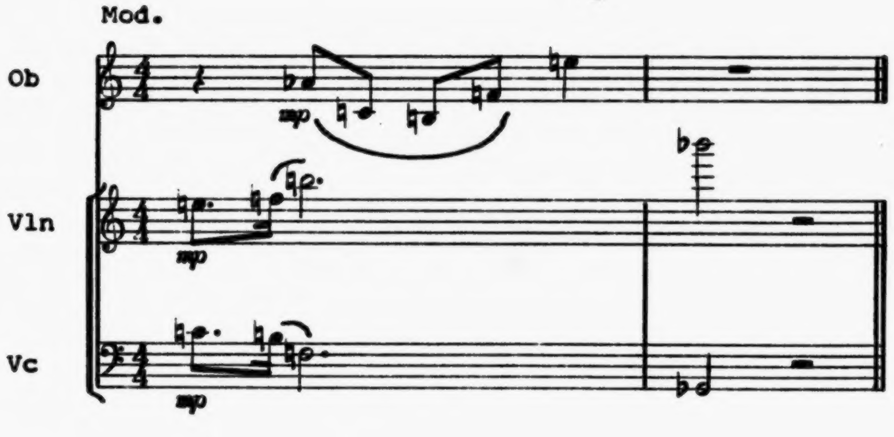
"1"


Mod. Slow
Ob
Vln
Vc
mf
mf
mf

"2"

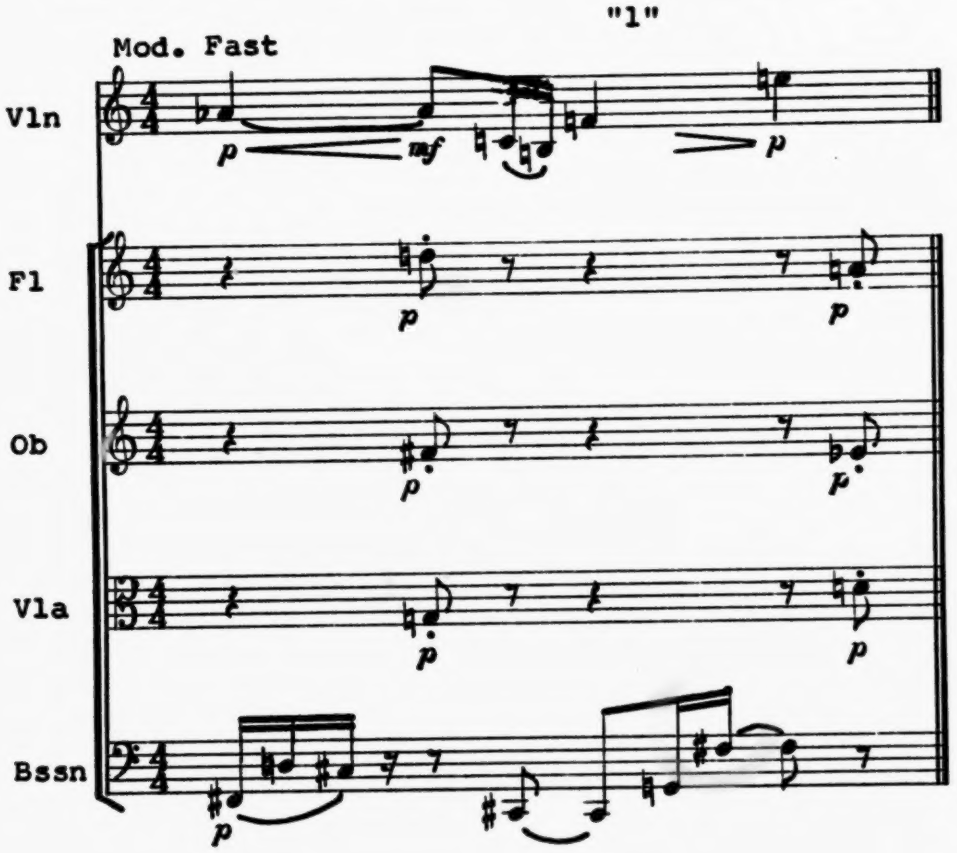

Mod. Slow
Ob
Vln
Vc
mf
mf
mf

"3"

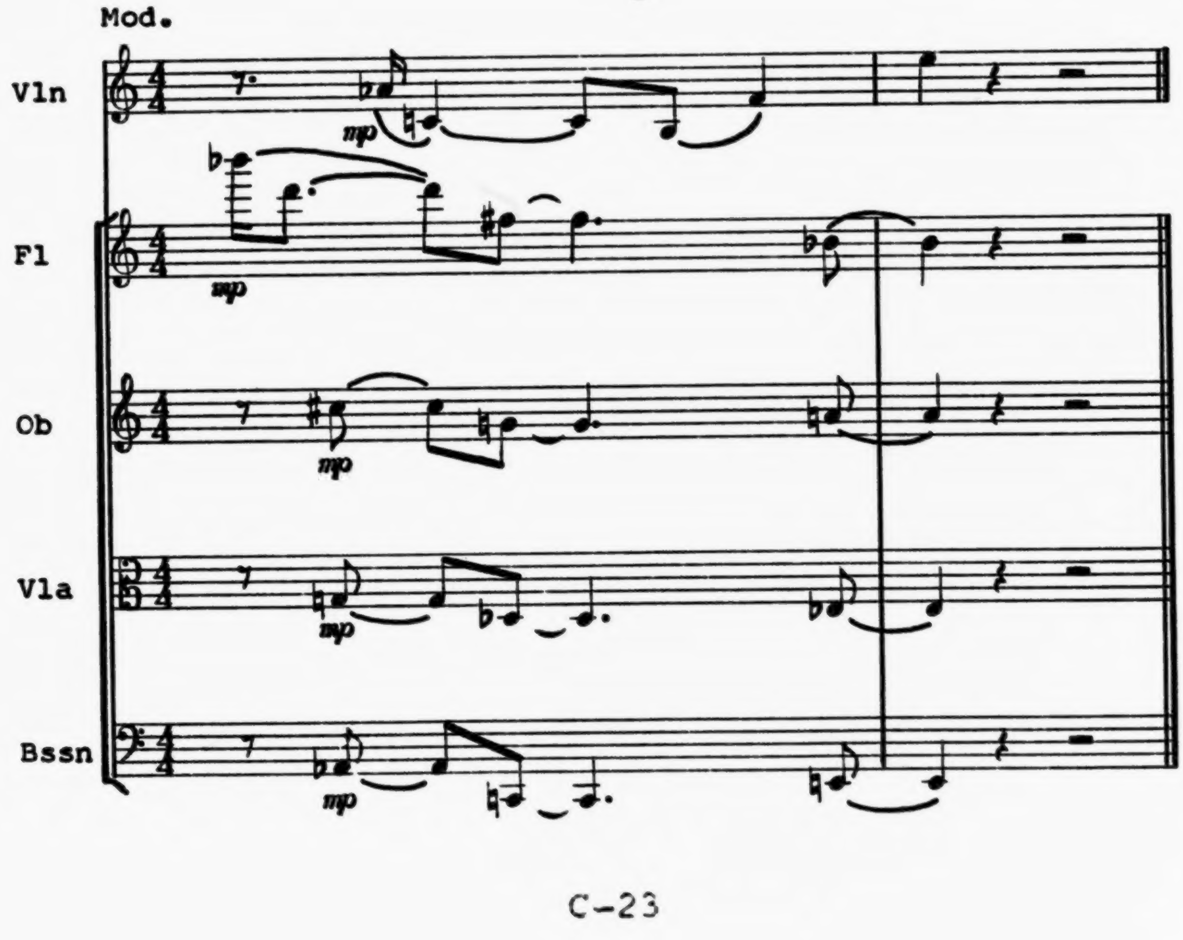

Mod.
Ob
Vln
Vc
mp
mp
mp

FIVE NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

"1"

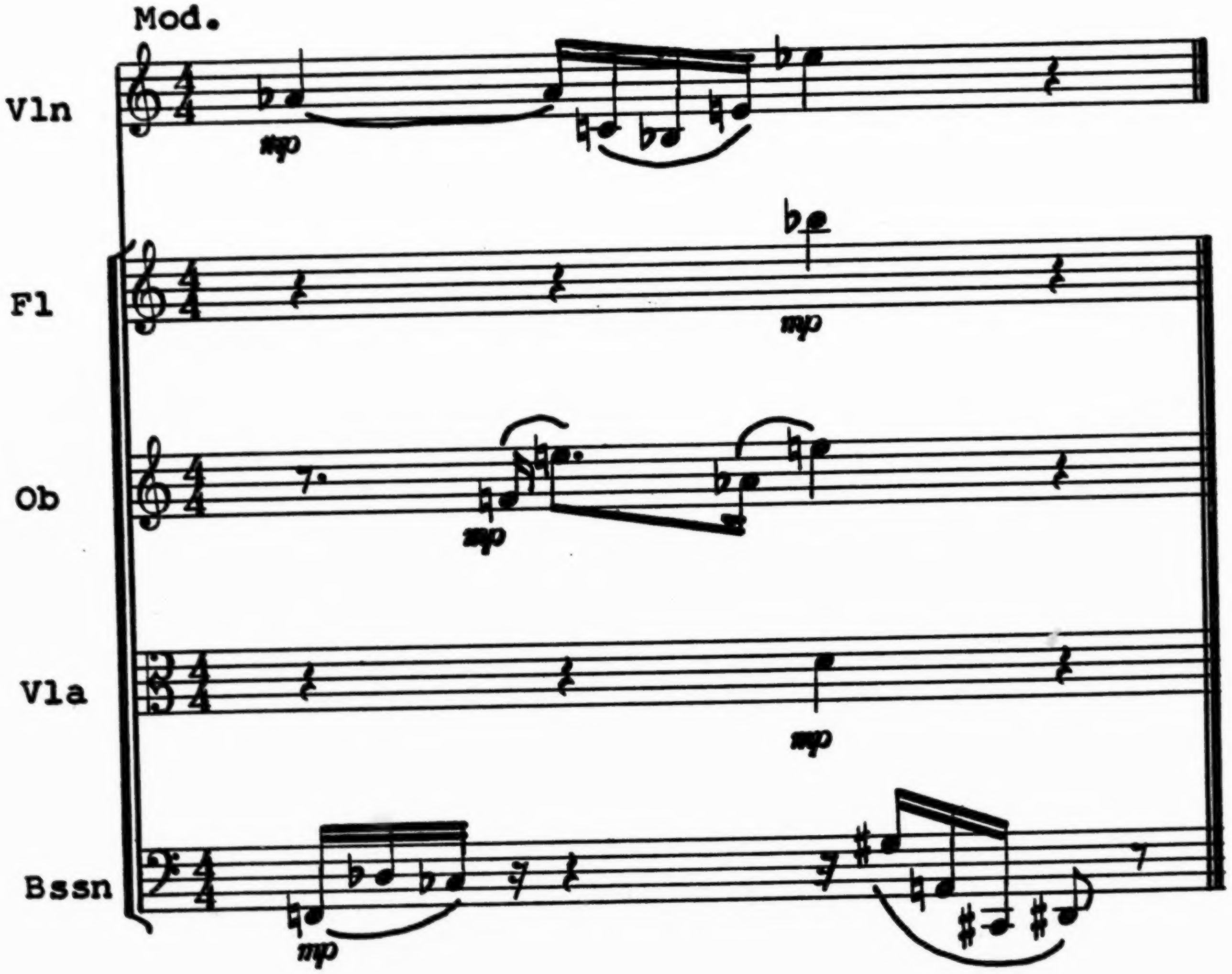

Mod. Fast
Vln
Fl
Ob
Vla
Bssn
p
mf
p

"2"


Mod.
Vln
Fl
Ob
Vla
Bssn
mp

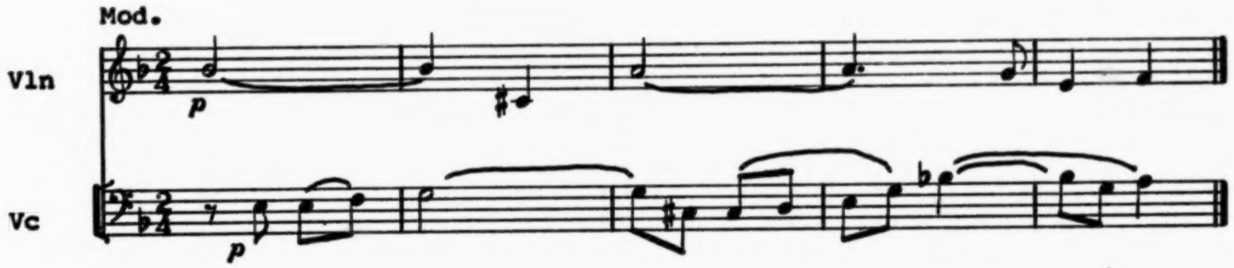
FIVE NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

"3"

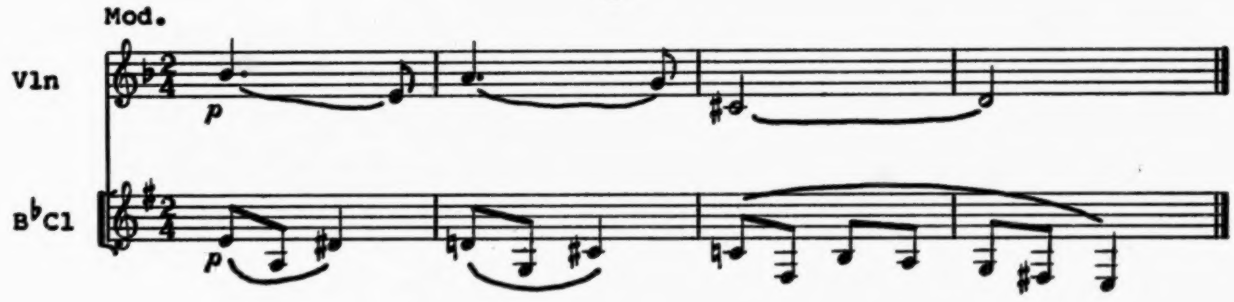

Mod.
Vln
Fl
Ob
Vla
Bssn
mp
mp
mp
mp
mp

SIX NOTE MELODY - TONAL - HIGH RANGE - ONE OTHER VOICE

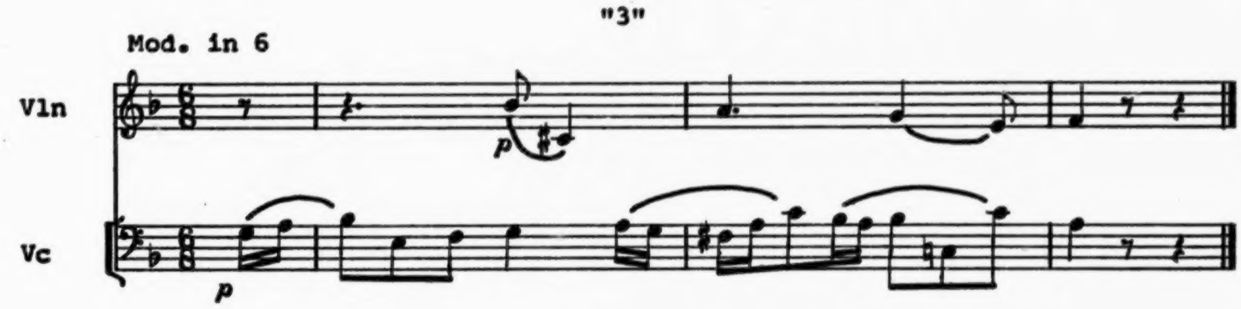
"1"


Mod.
Vln
Vc
p
p

"2"

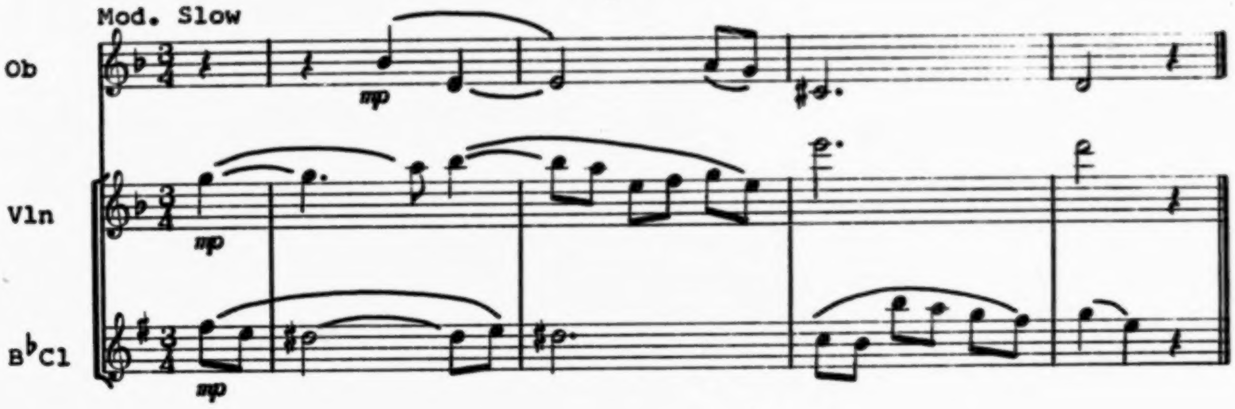

Mod.
Vln
B♭Cl
p
p

"3"

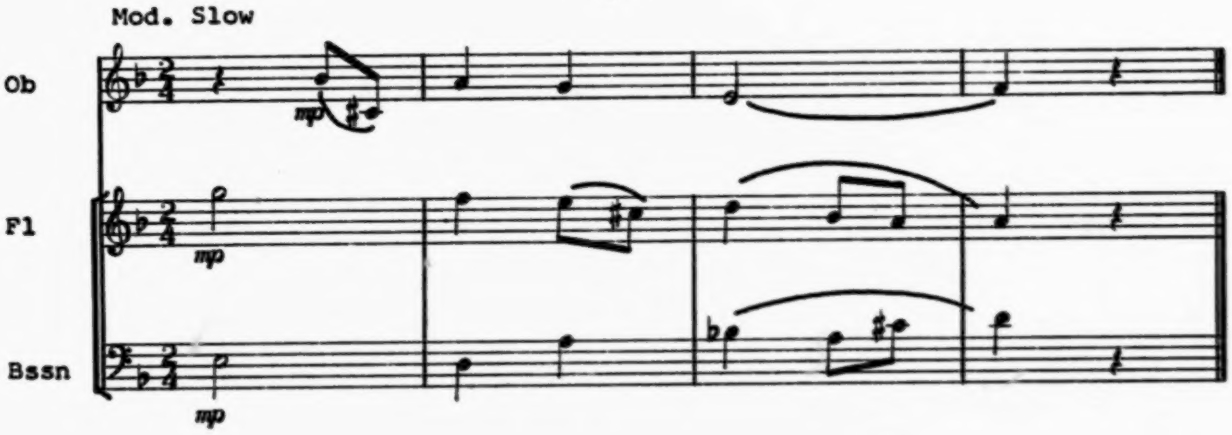

Mod. in 6
Vln
Vc
p
p

SIX NOTE MELODY - TONAL - HIGH RANGE - TWO OTHER VOICES

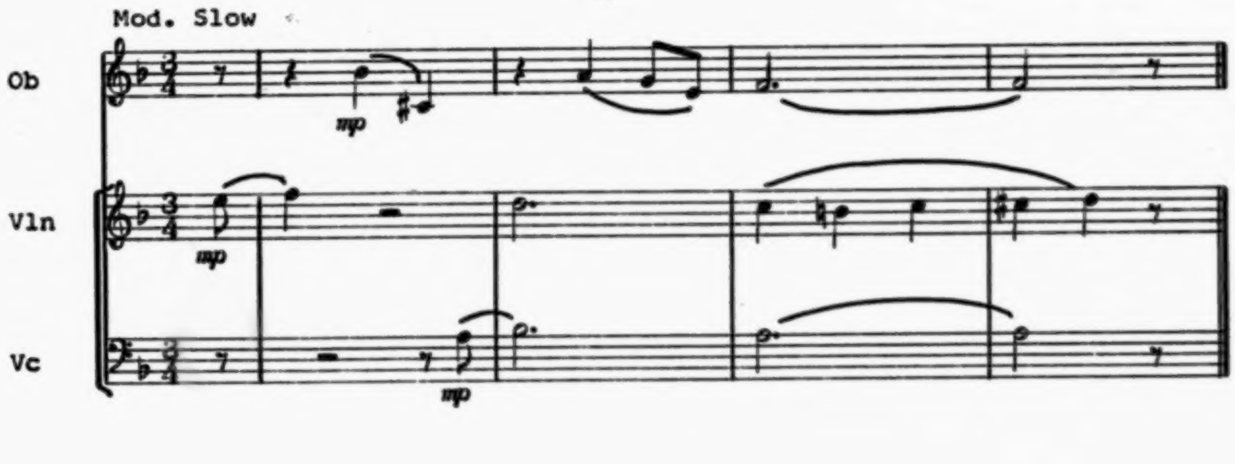
"1"


Mod. Slow
Ob
Vln
B♭Cl
mp
mp
mp

"2"

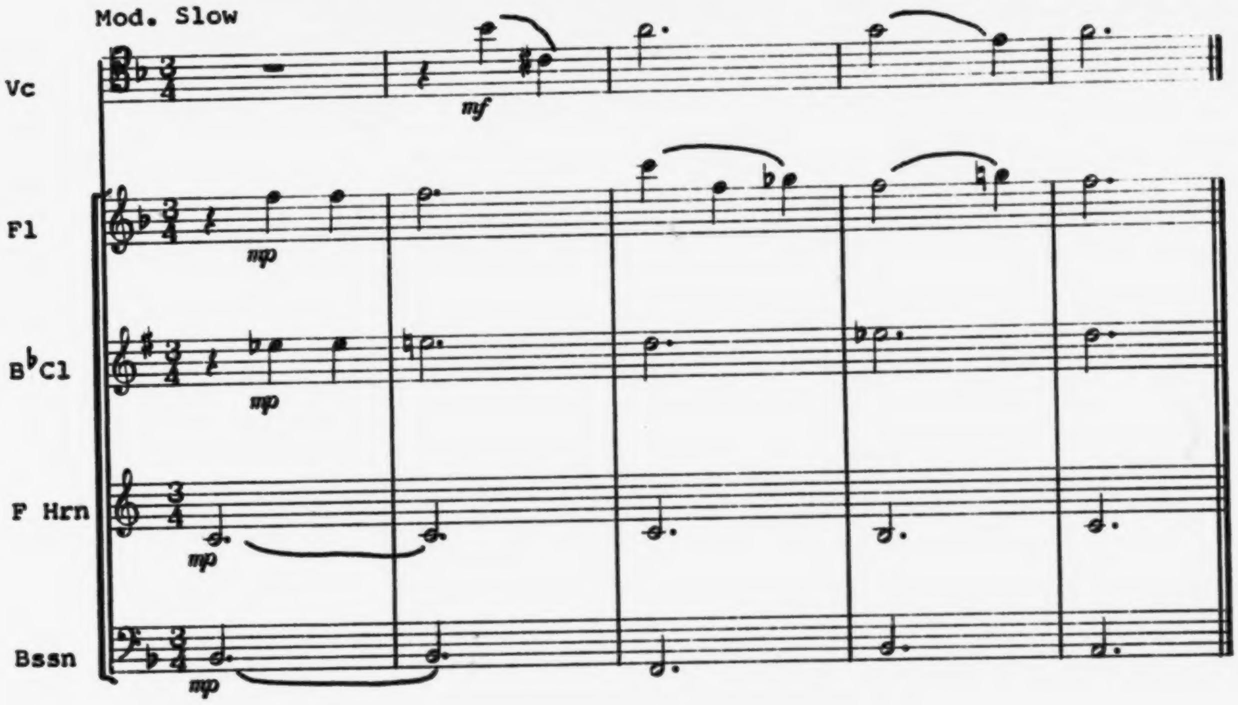

Mod. Slow
Ob
Fl
Bssn
mp
mp
mp

"3"

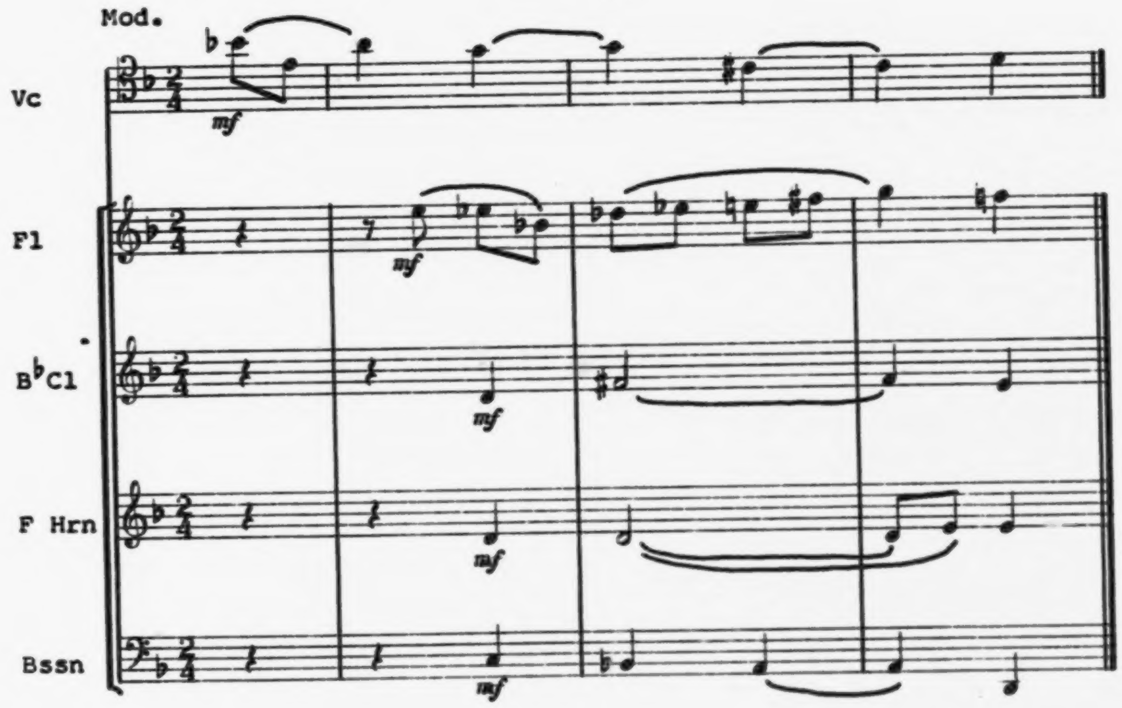

Mod. Slow
Ob
Vln
Vc
mp
mp
mp

SIX NOTE MELODY - TONAL - HIGH RANGE - FOUR OTHER VOICES

"1"

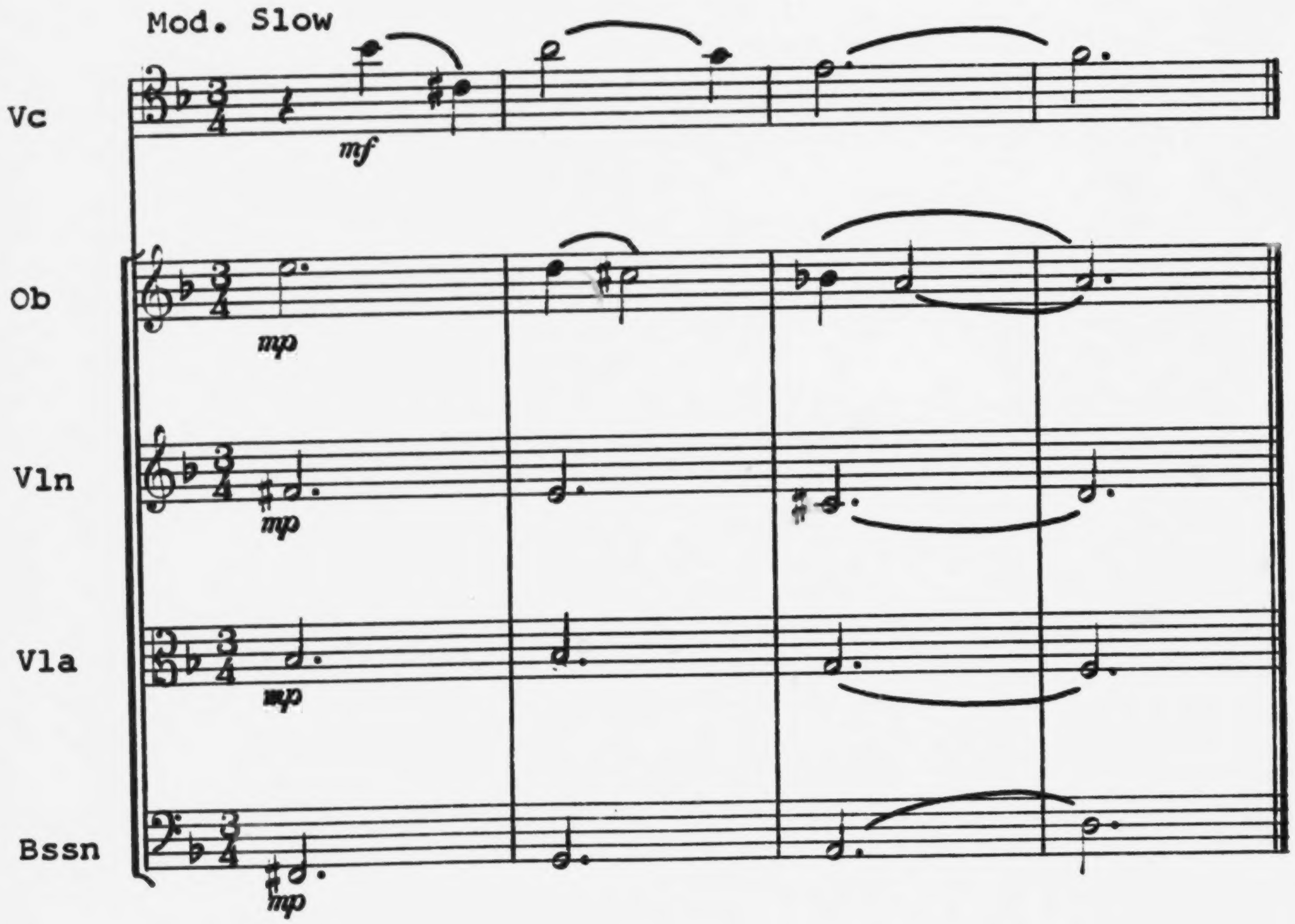

Mod. Slow
Vc
Fl
B♭Cl
F Hrn
Bssn
mf
mp
mp
mp
mp

"2"


Mod.
Vc
Fl
B♭Cl
F Hrn
Bssn
mf
mf
mf
mf
mf

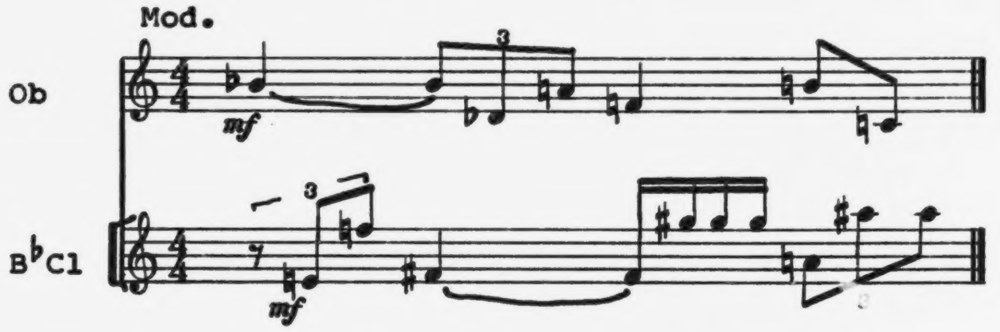
SIX NOTE MELODY - TONAL - HIGH RANGE - FOUR OTHER VOICES

"3"

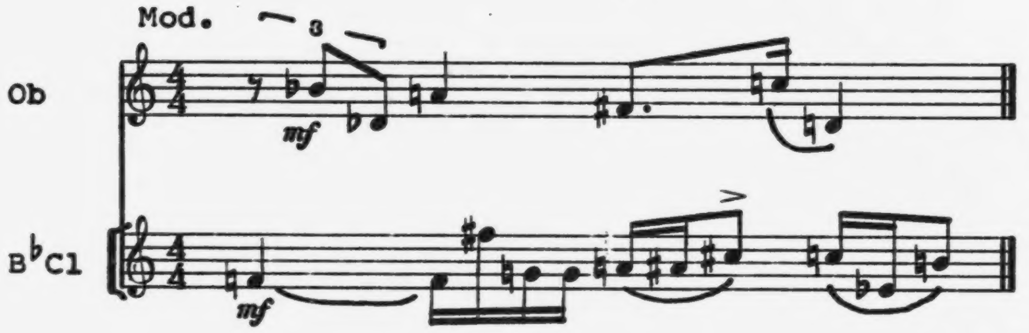

Mod. Slow
Vc
Ob
Vln
Vla
Bssn
mf
mp
mp
mp
mp

SIX NOTE MELODY - ATONAL - HIGH RANGE - ONE OTHER VOICE

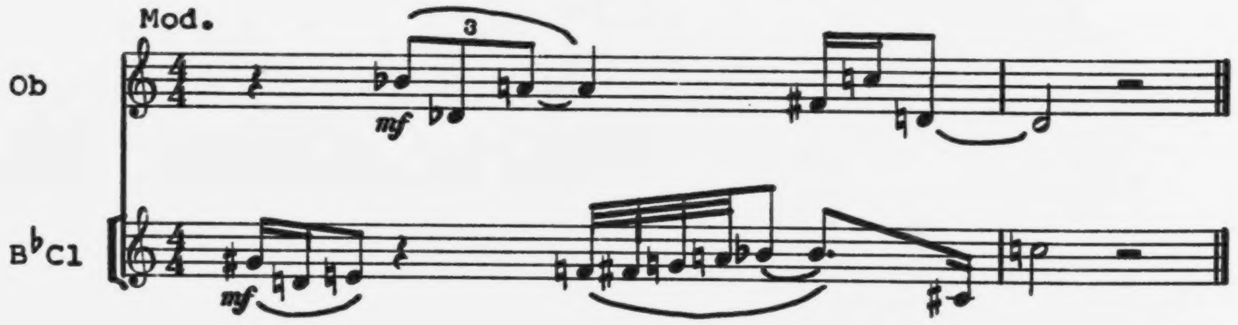
"1"


Mod.
Ob
mf
3
B♭Cl
3
mf

"2"

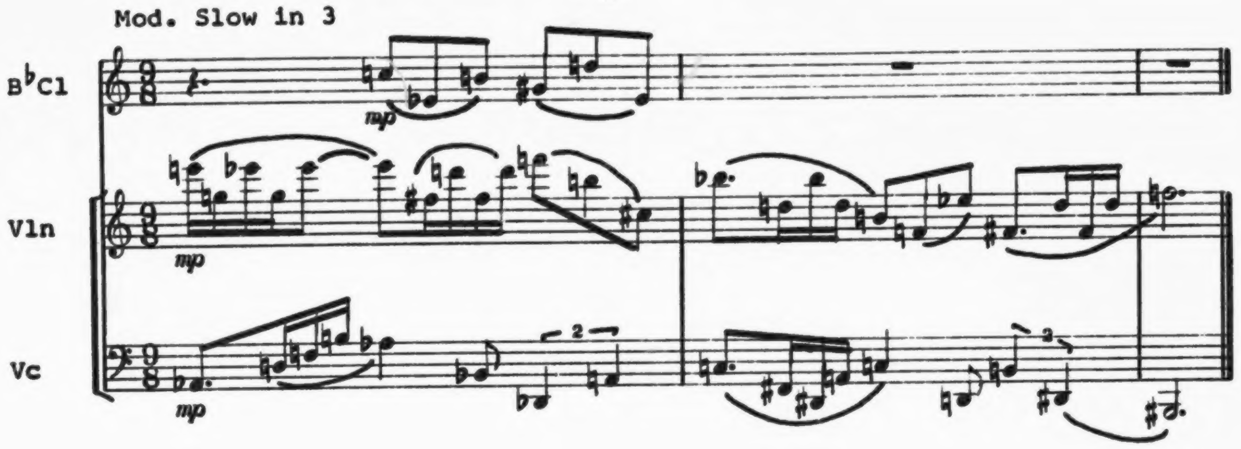

Mod.
3
Ob
mf
B♭Cl
mf

"3"

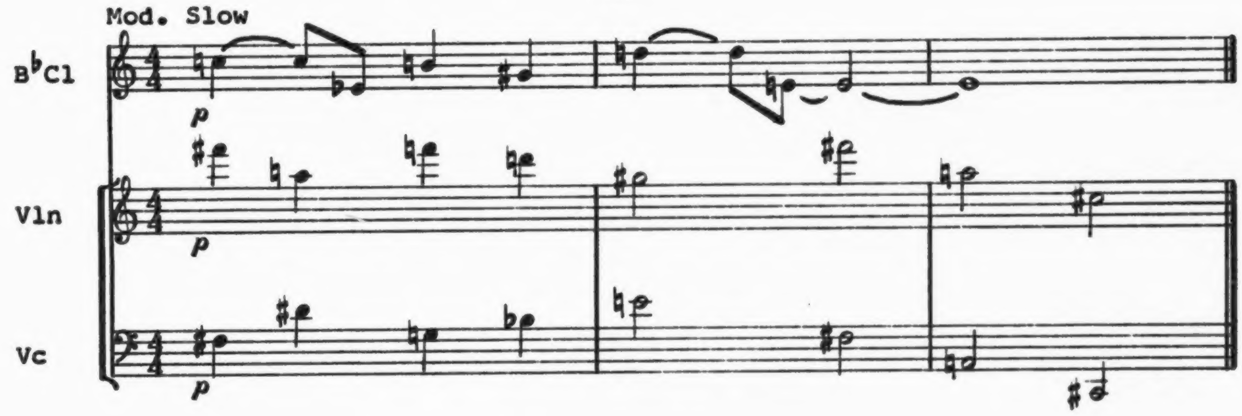

Mod.
3
Ob
mf
B♭Cl
mf

SIX NOTE MELODY - ATONAL - HIGH RANGE - TWO OTHER VOICES

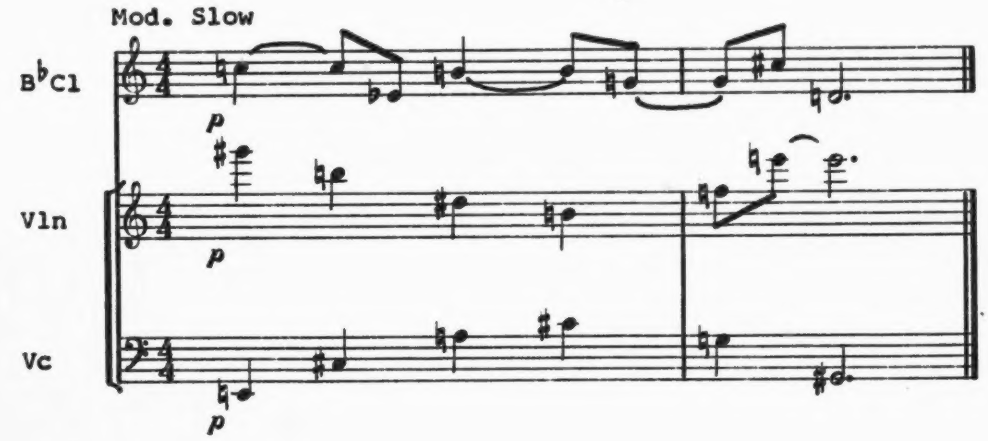
"1"


Mod. Slow in 3
B♭Cl
Vln
Vc
mp
2
3

"2"

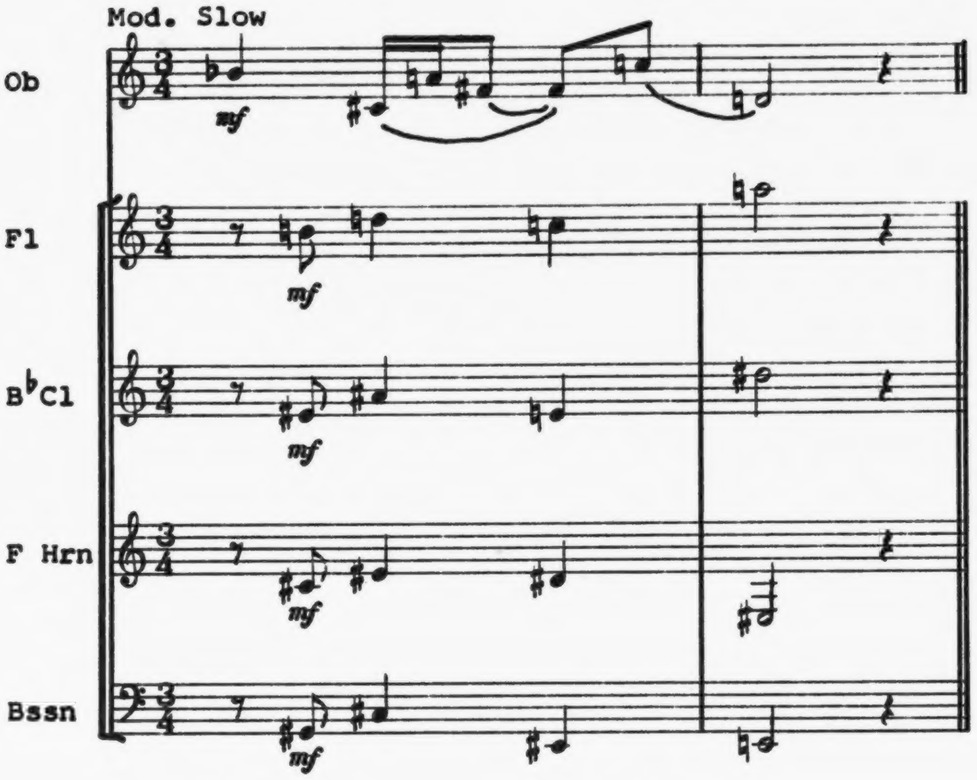

Mod. Slow
B♭Cl
Vln
Vc
p

"3"

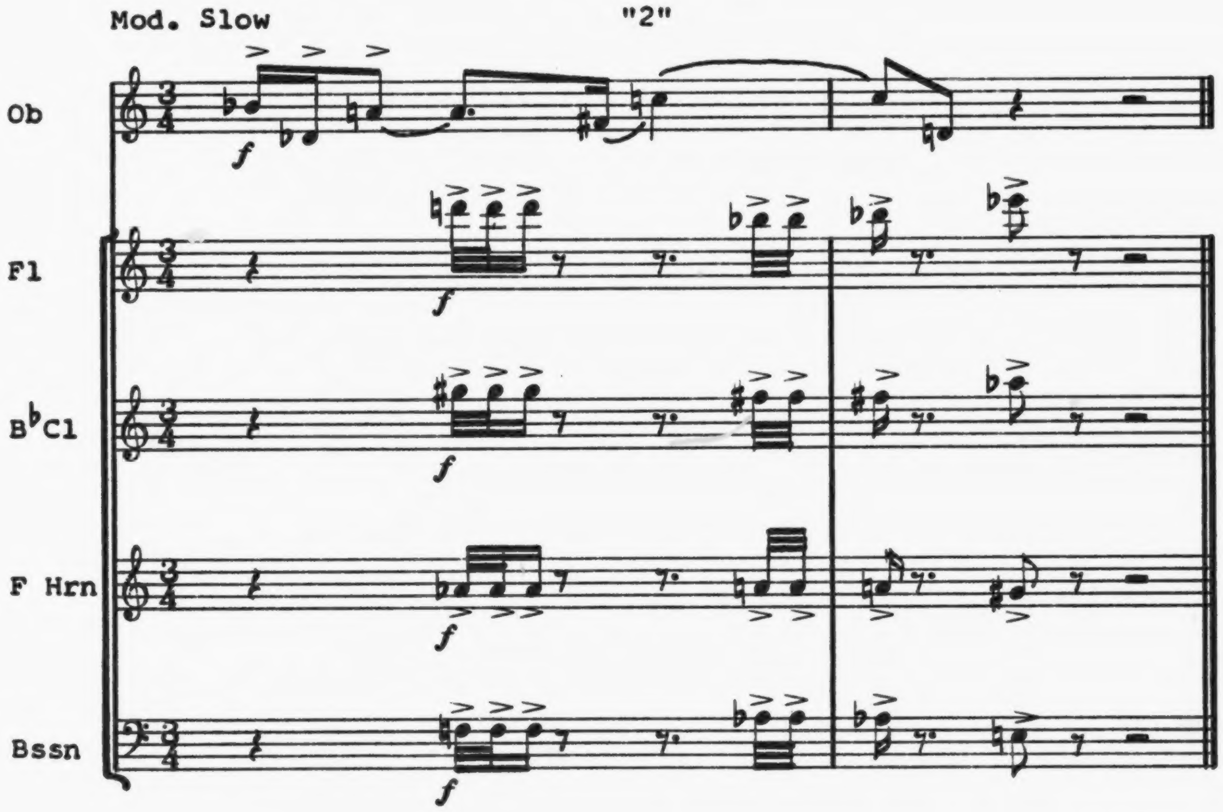

Mod. Slow
B♭Cl
Vln
Vc
p

SIX NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

"1"

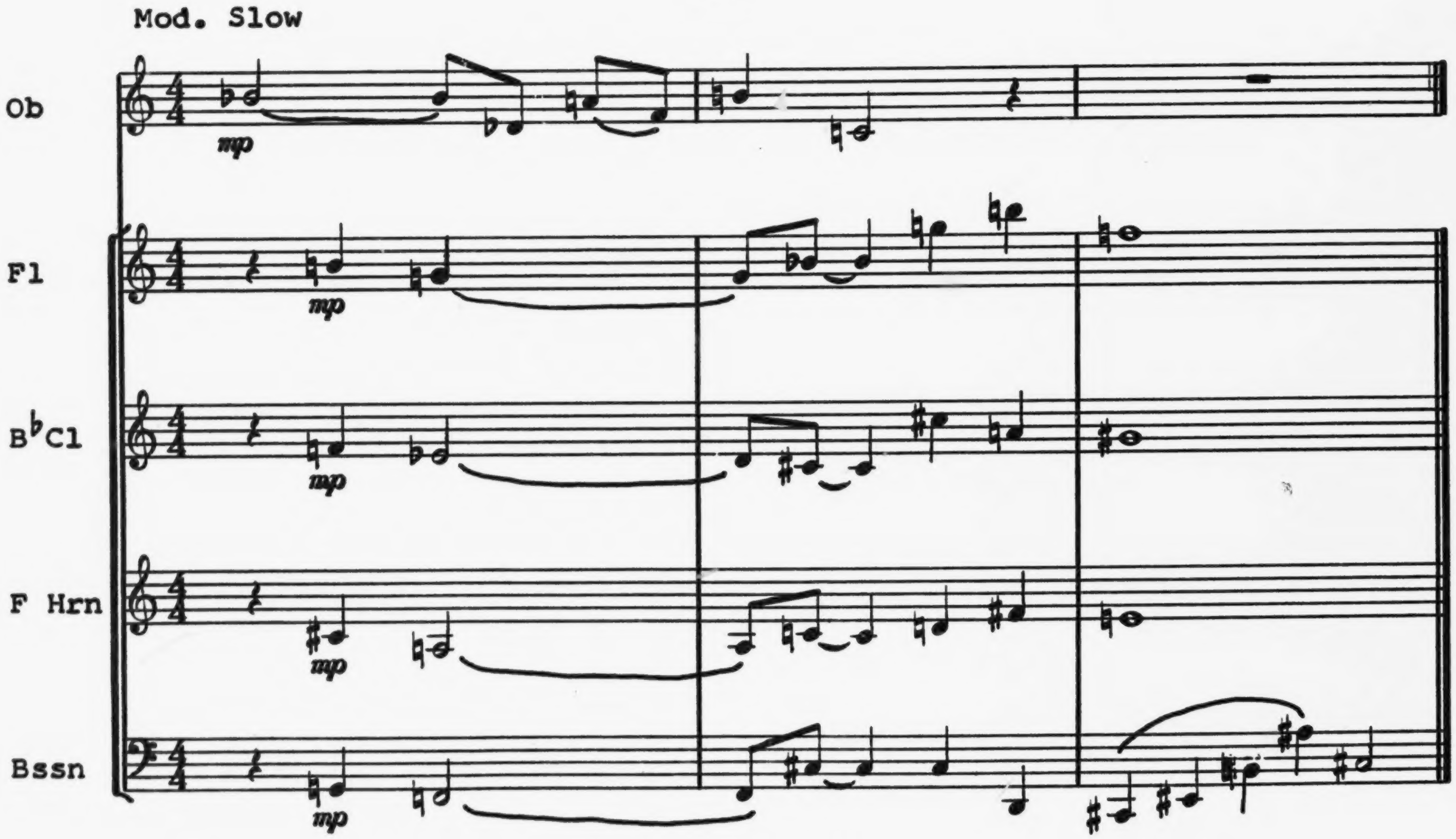

Mod. Slow
Ob
Fl
B♭Cl
F Hrn
Bssn
mf

"2"


Mod. Slow
Ob
Fl
B♭Cl
F Hrn
Bssn
f

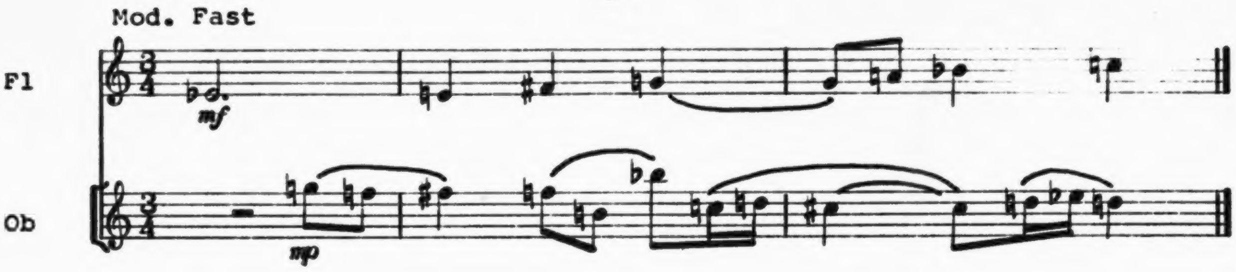
SIX NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

"3"

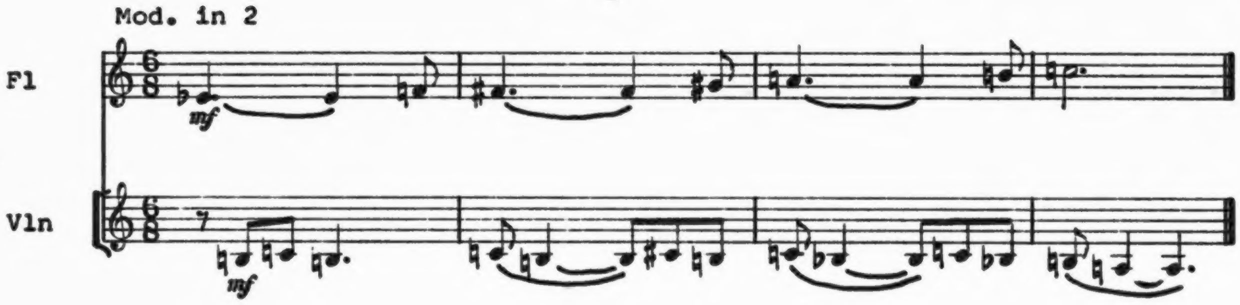

Mod. Slow
Ob
Fl
B♭Cl
F Hrn
Bssn
mp
mp
mp
mp
mp

SEVEN NOTE MELODY - ATONAL - HIGH RANGE - ONE OTHER VOICE

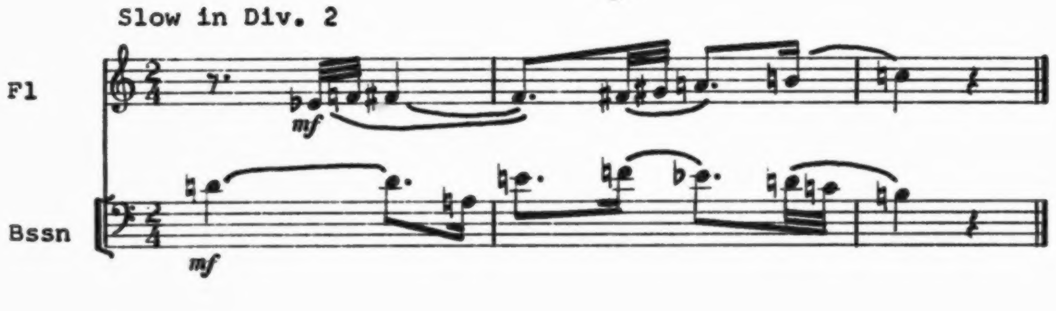
"1"


Mod. Fast
Fl
Ob
mf
mp

"2"

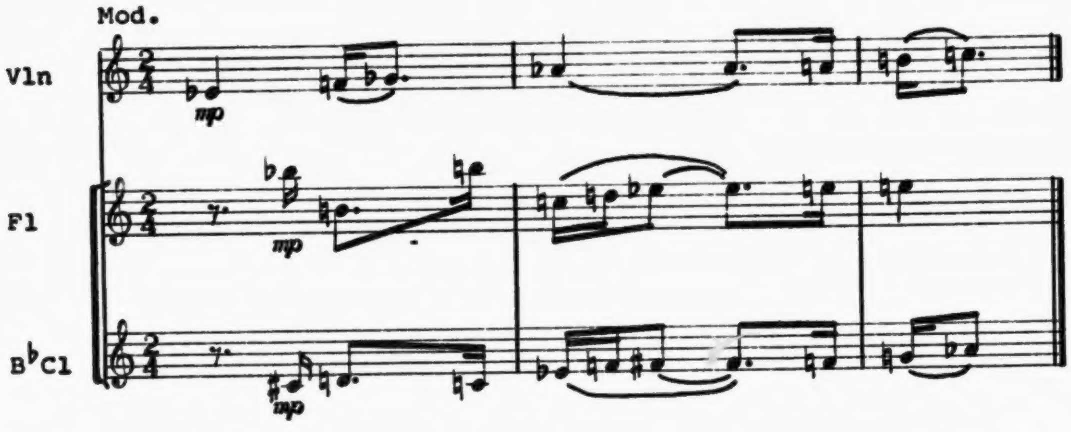

Mod. in 2
Fl
Vln
mf
mf

"3"

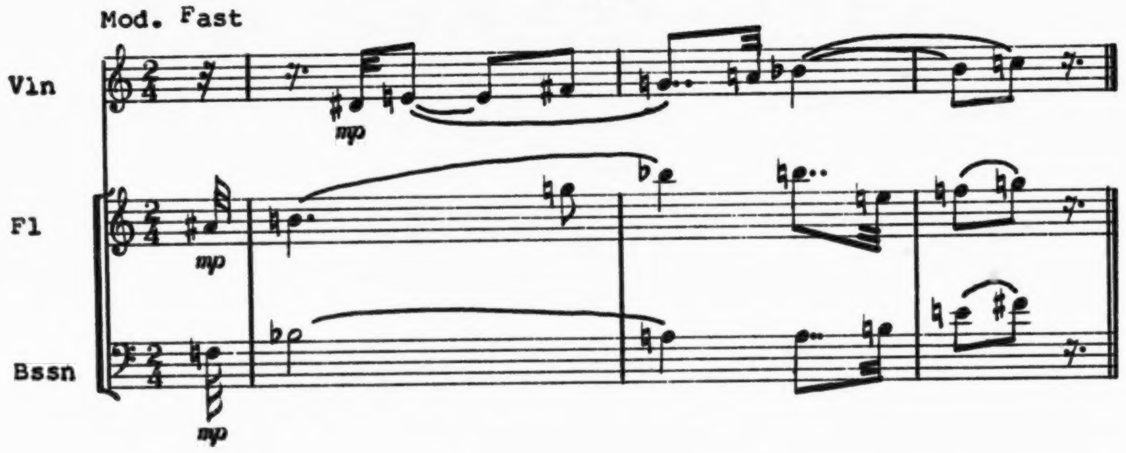

Slow in Div. 2
Fl
Bssn
mf
mf

SEVEN NOTE MELODY - ATONAL - HIGH RANGE - TWO OTHER VOICES

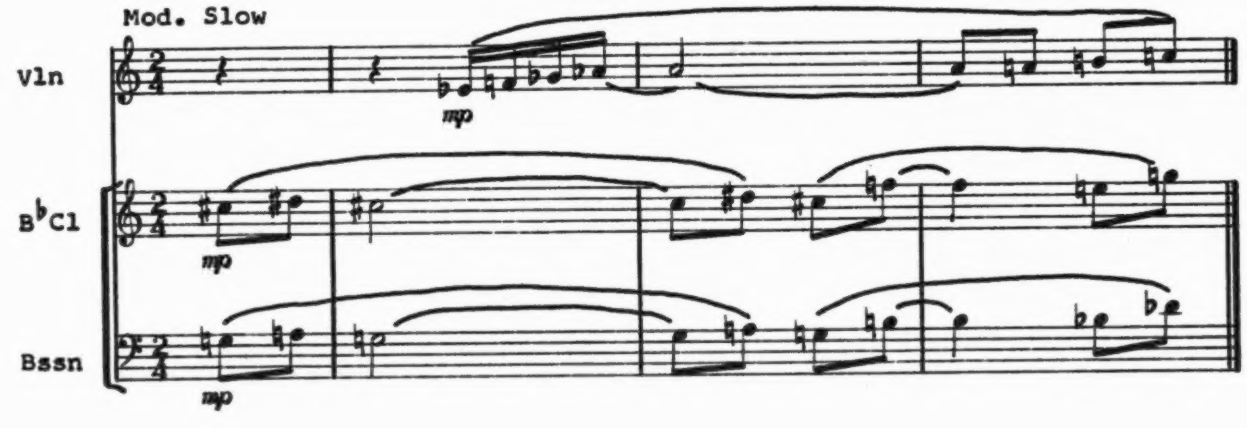
"1"


Mod.
Vln
Fl
B♭Cl
mp
mp
mp

"2"


Mod. Fast
Vln
Fl
Bssn
mp
mp
mp

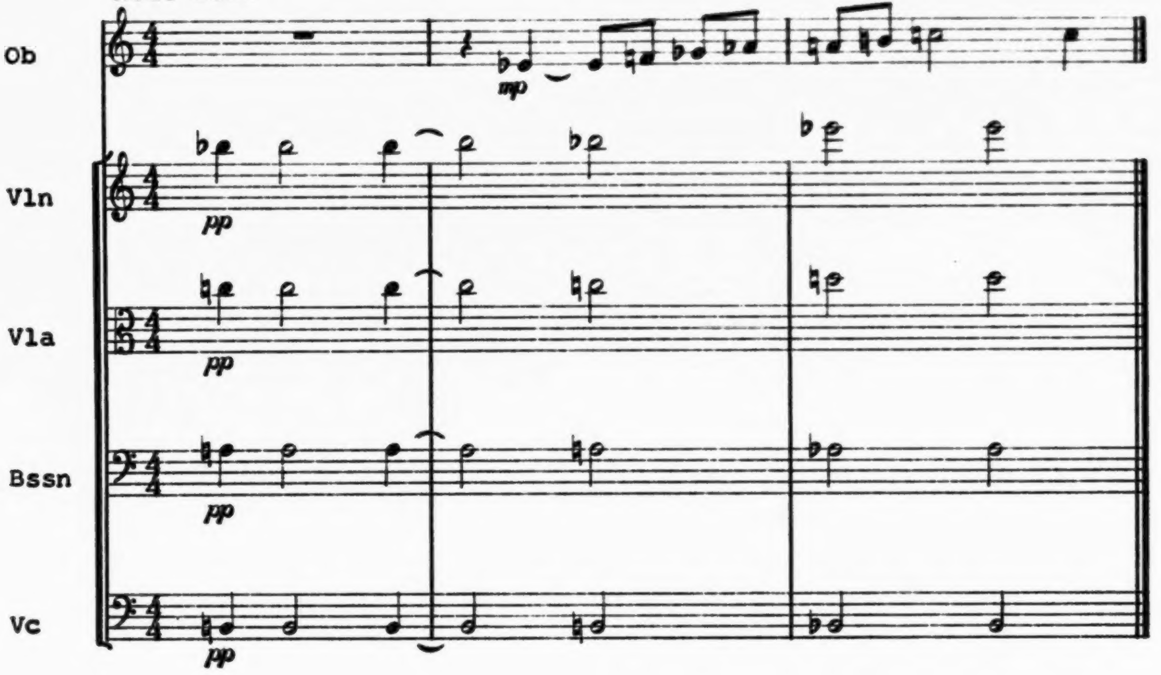
"3"


Mod. Slow
Vln
B♭Cl
Bssn
mp
mp
mp

SEVEN NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

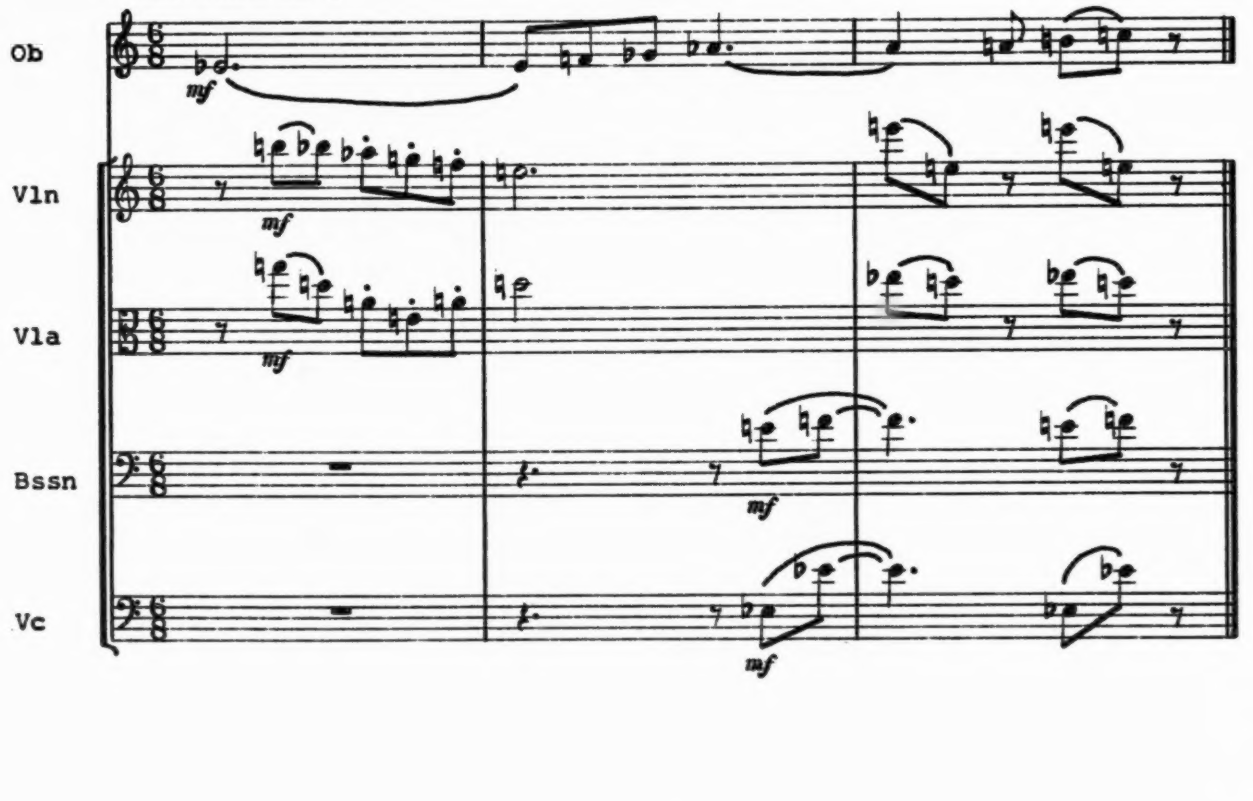
"1"

Mod. Slow


Ob
Vln
Vla
Bssn
Vc
mp
pp

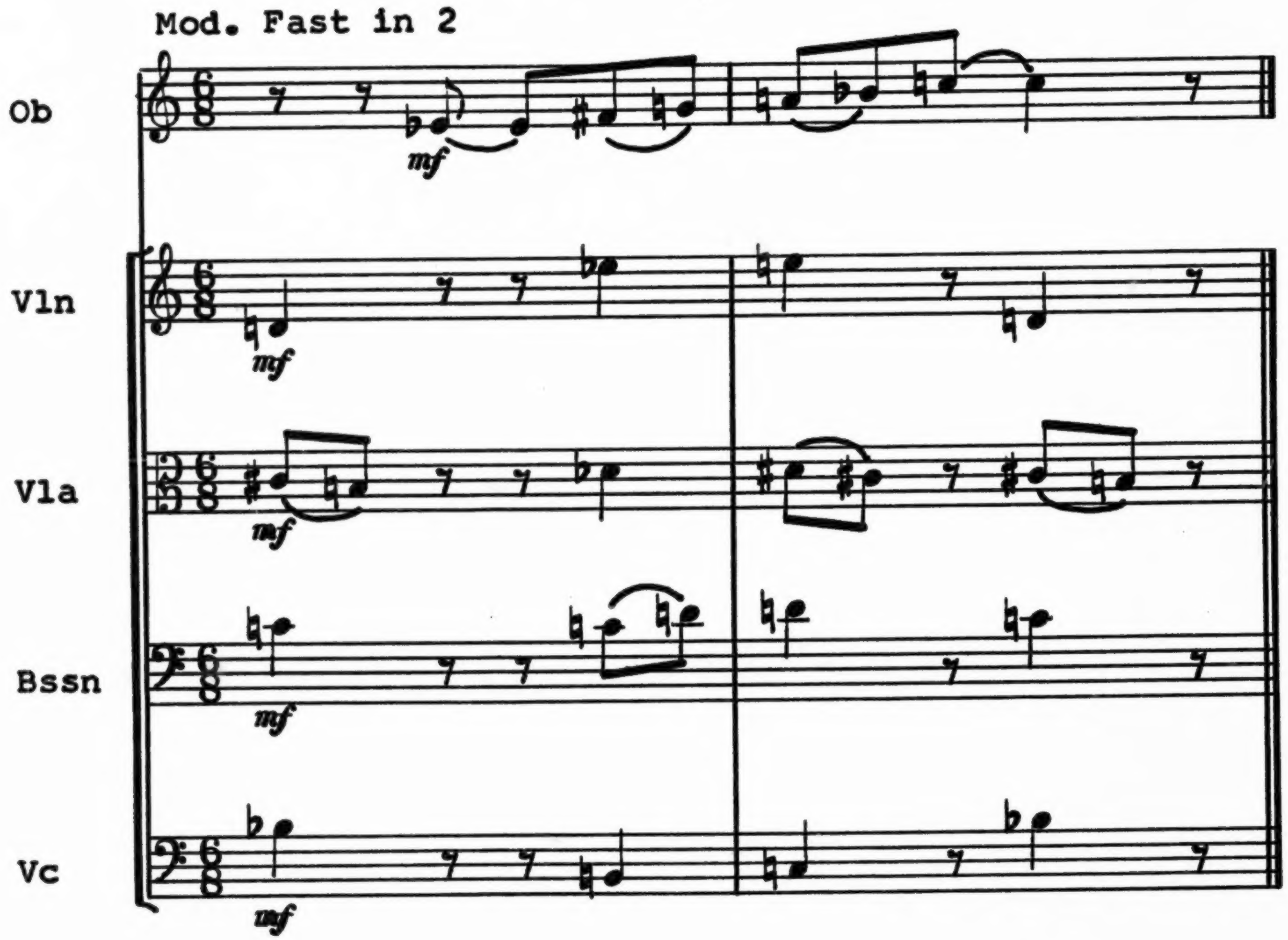
"2"

Mod. Fast in 2


Ob
Vln
Vla
Bssn
Vc
mf

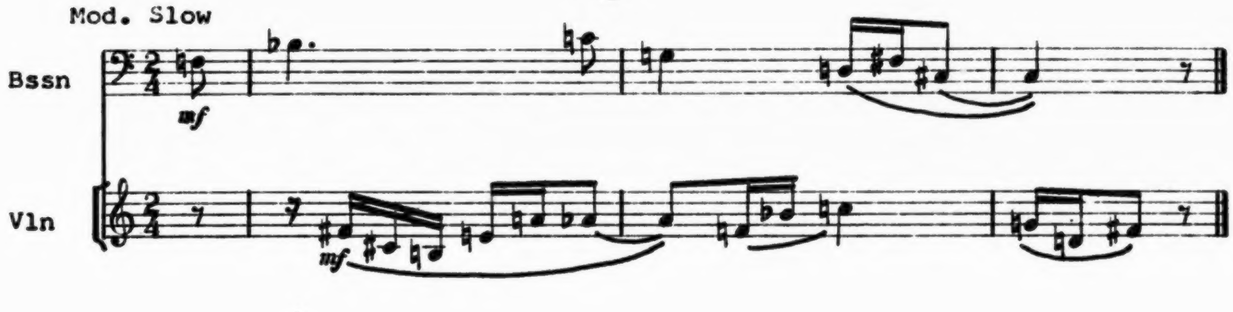
SEVEN NOTE MELODY - ATONAL - HIGH RANGE - FOUR OTHER VOICES

"3"

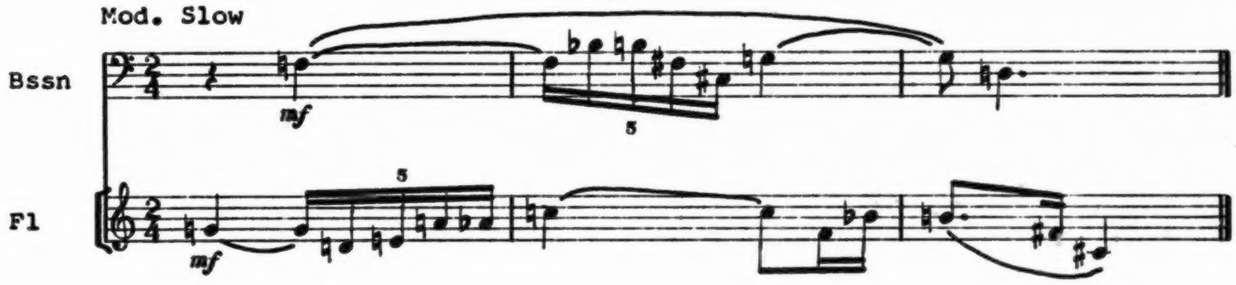

Mod. Fast in 2
Ob
Vln
Vla
Bssn
Vc
mf

SEVEN NOTE MELODY - ATONAL - LOW RANGE - ONE OTHER VOICE

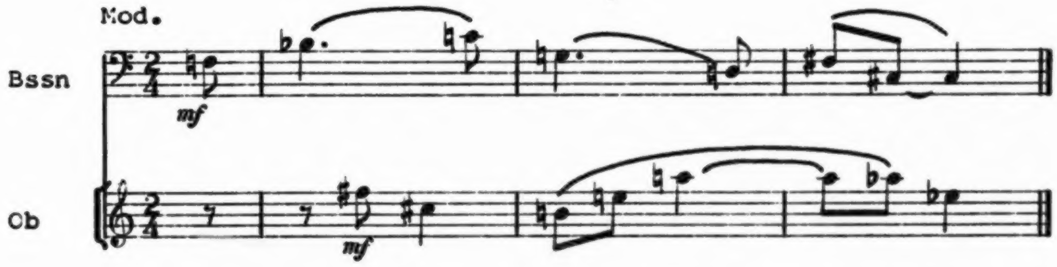
"1"


Mod. Slow
Bssn
mf
Vln
mf

"2"

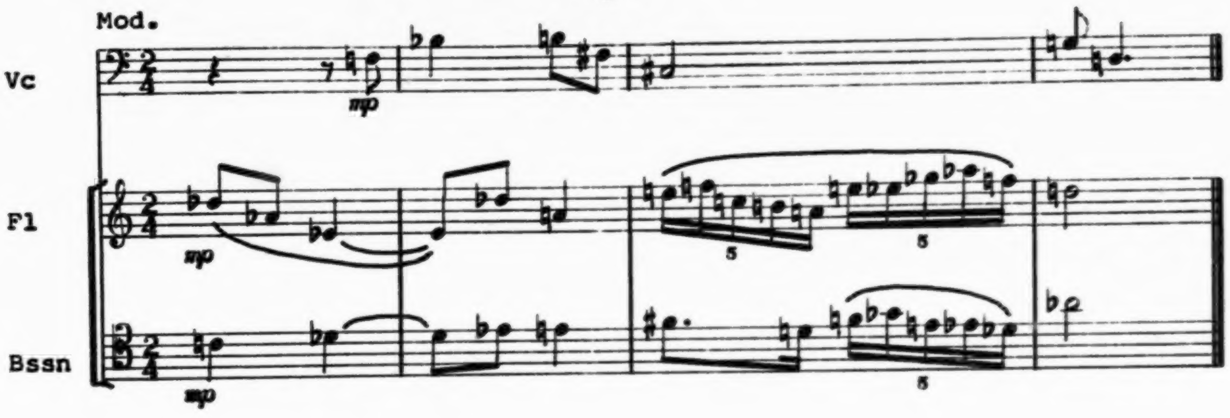

Mod. Slow
Bssn
mf
5
Fl
mf
5

"3"

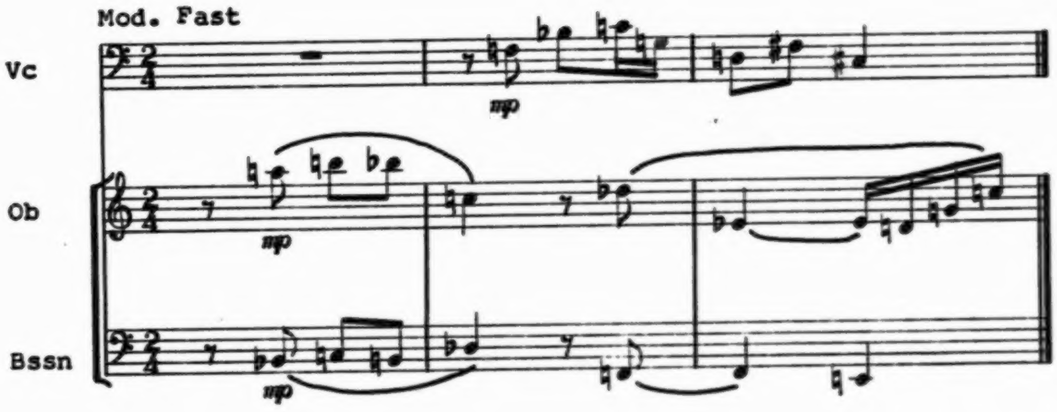

Mod.
Bssn
mf
Ob
mf

SEVEN NOTE MELODY - ATONAL - LOW RANGE - TWO OTHER VOICES

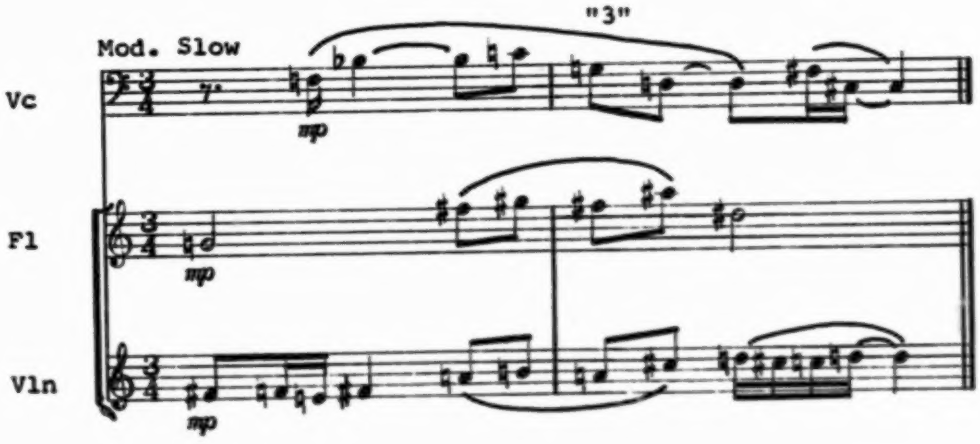
"1"


Mod.
Vc
Fl
Bssn
mp
mp
mp
5
5
5

"2"

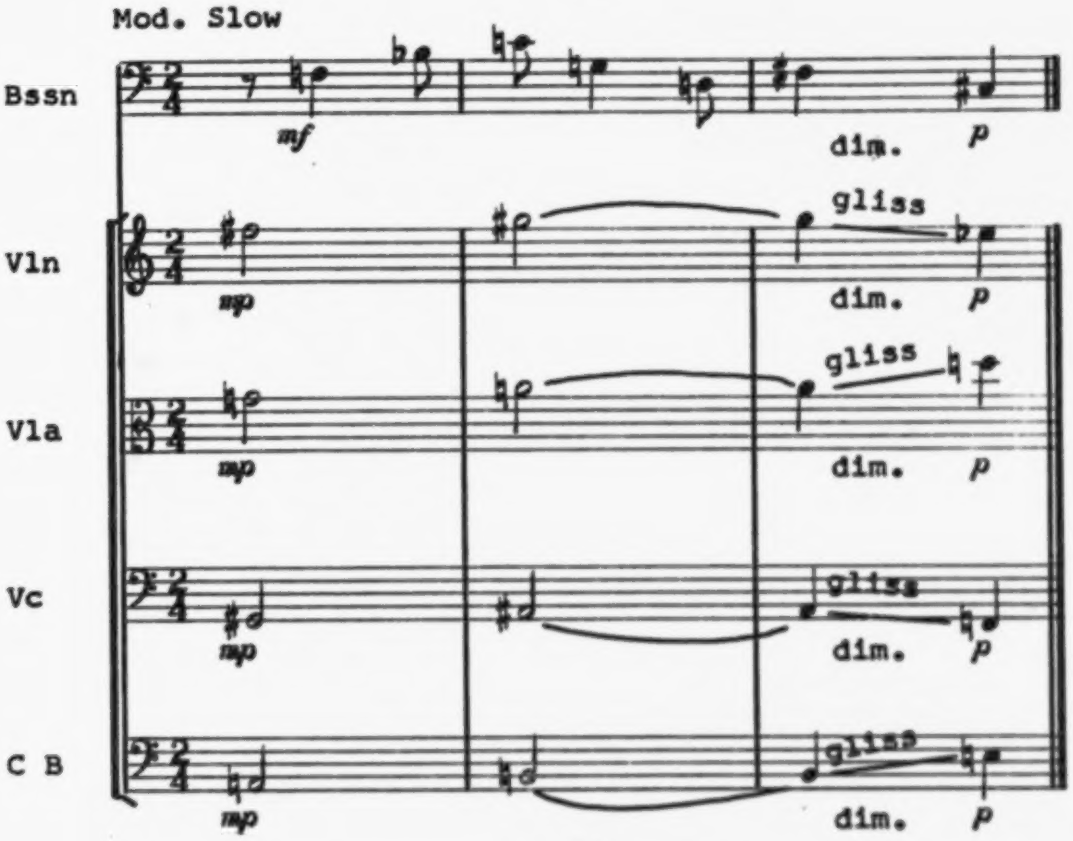

Mod. Fast
Vc
Ob
Bssn
mp
mp
mp

"3"

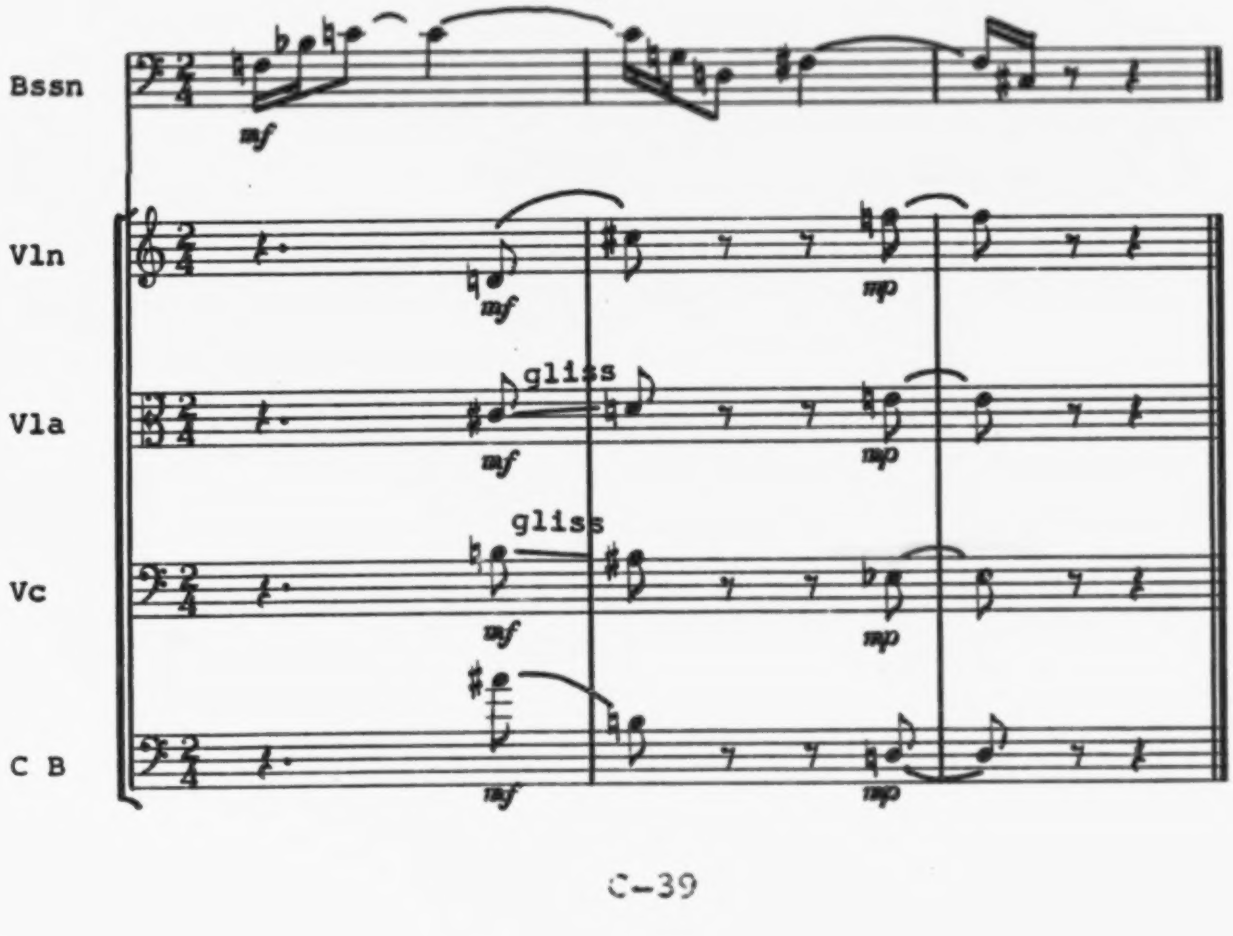

Mod. Slow
Vc
Fl
Vln
mp
mp
mp

SEVEN NOTE MELODY - ATONAL - LOW RANGE - FOUR OTHER VOICES

"1"

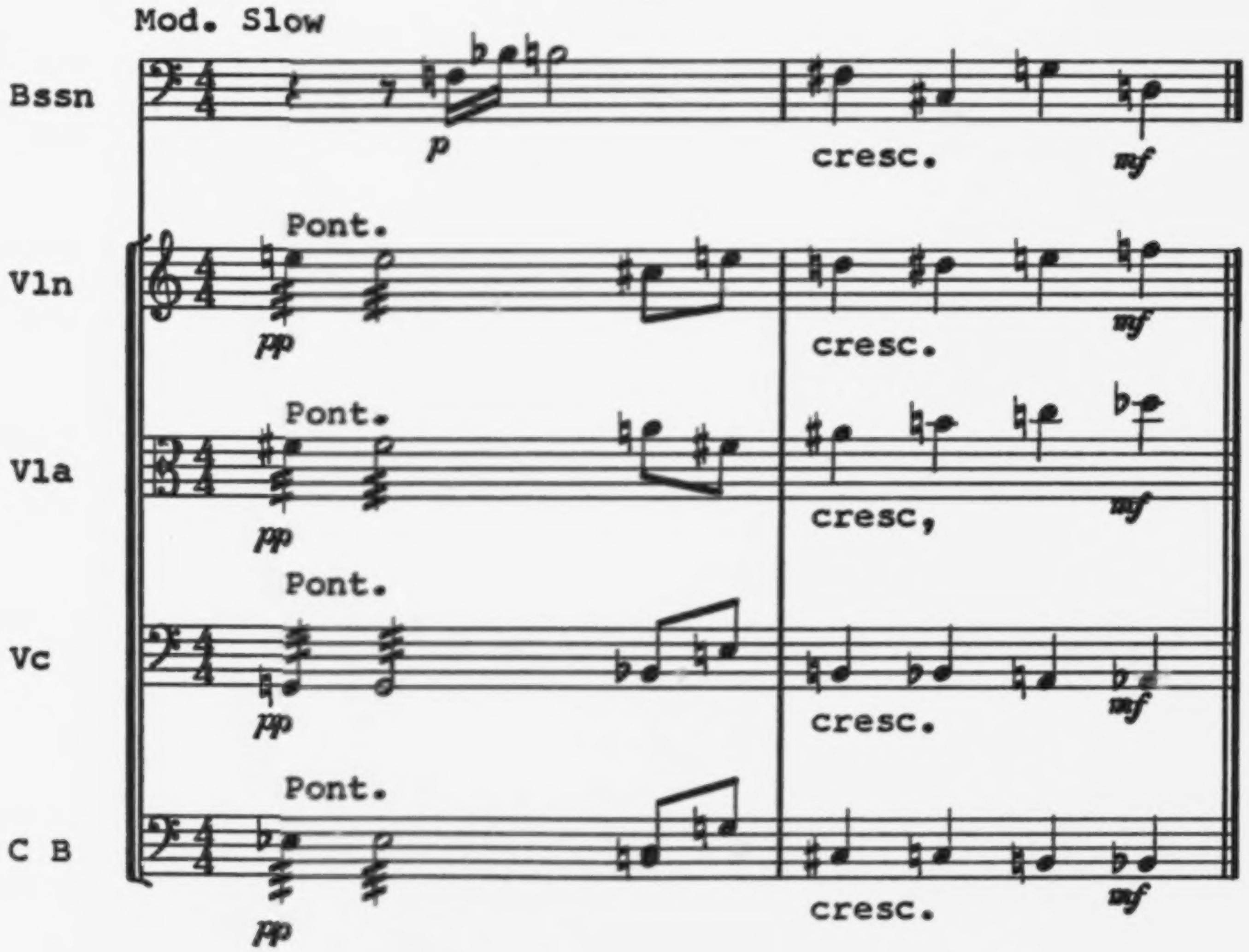

Mod. Slow
Bssn
Vln
Vla
Vc
C B
mf
mp
dim.
p
gliss

"2"


Bssn
Vln
Vla
Vc
C B
mf
mp
gliss

SEVEN NOTE MELODY - ATONAL - LOW RANGE - FOUR OTHER VOICES

"3"


Mod. Slow
Bssn
Vln
Vla
Vc
C B
p
Pont.
pp
cresc.
cresc,
mf

BALL STATE UNIVERSITY

MUSIC THEORY PROJECT (SHERMAN)

PAGE ____ OF ____ PAGES

NAME __________________________________
LAST FIRST

PERMANENT STUDENT NUMBER __________ SECTION _____

____
NUMBER OF ITEMS

____
NUMBER CORRECT

____
NUMBER WRONG

CHECK ONE
( ) PRACTICE EXERCISE
( ) SELF-ADMINISTERED TEST
( ) CLASS TEST
( ) OTHER ________________
IDENTIFY

CHECK ONE
( ) AUDIO ONLY
( ) VISUAL ONLY
( ) EITHER AUDIO-VISUAL OR VISUAL-AUDIO

CHECK ONE
( ) TONAL
( ) ATONAL
( ) TONAL-ATONAL
( ) ATONAL-TONAL

CODE NUMBER ____________

PHYSIOLOGICAL AND PSYCHOLOGICAL STATE AT TIME OF RESPONDING
CHECK ONE
( ) EXCEPTIONALLY GOOD
( ) GOOD
( ) AVERAGE
( ) POOR
( ) EXCEPTIONALLY POOR

1	1	2	3
2	1	2	3
3	1	2	3
4	1	2	3
5	1	2	3
6	1	2	3
7	1	2	3
8	1	2	3
9	1	2	3
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11	1	2	3
12	1	2	3
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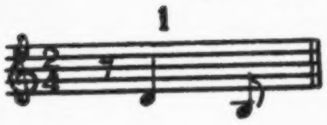
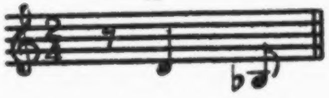
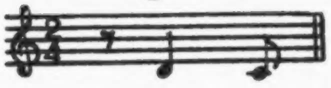
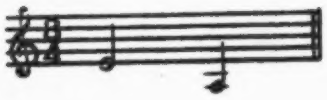
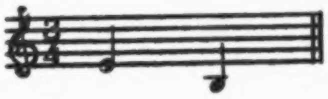
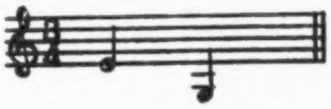
75	1	2	3
76	1	2	3
77	1	2	3
78	1	2	3
79	1	2	3
80	1	2	3

PRETEST-POSTTEST

Selected Response - Visual

1 2 3

1. Fr. Horn




2. Fr. Horn




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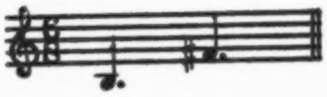
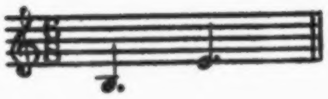
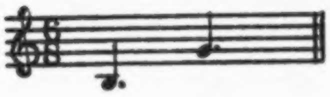

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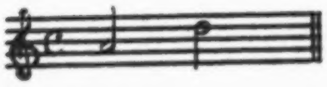
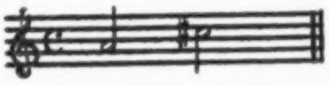
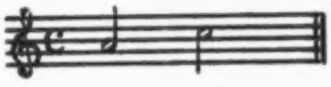

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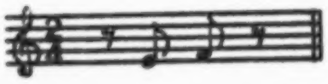
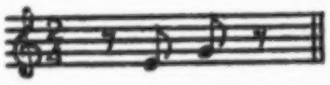
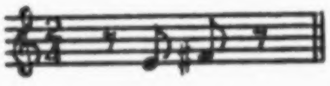

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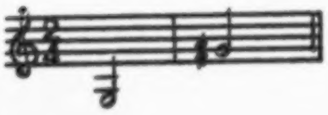
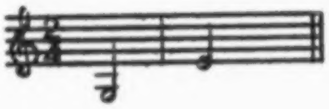
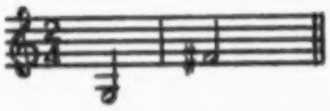

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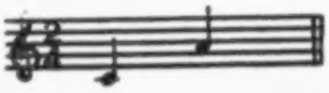
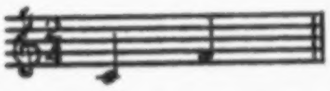
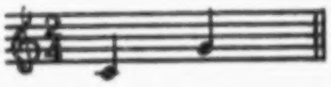

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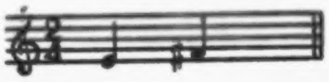
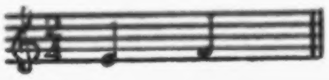
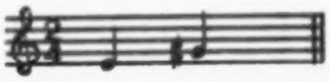
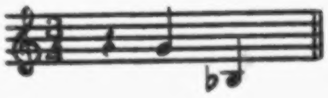
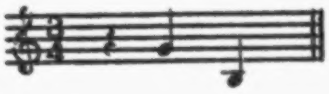
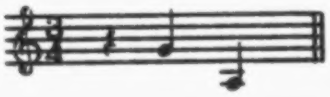




9. Viola




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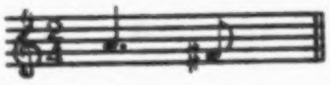
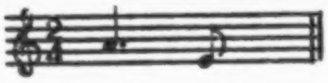
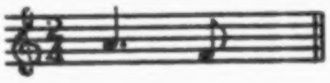
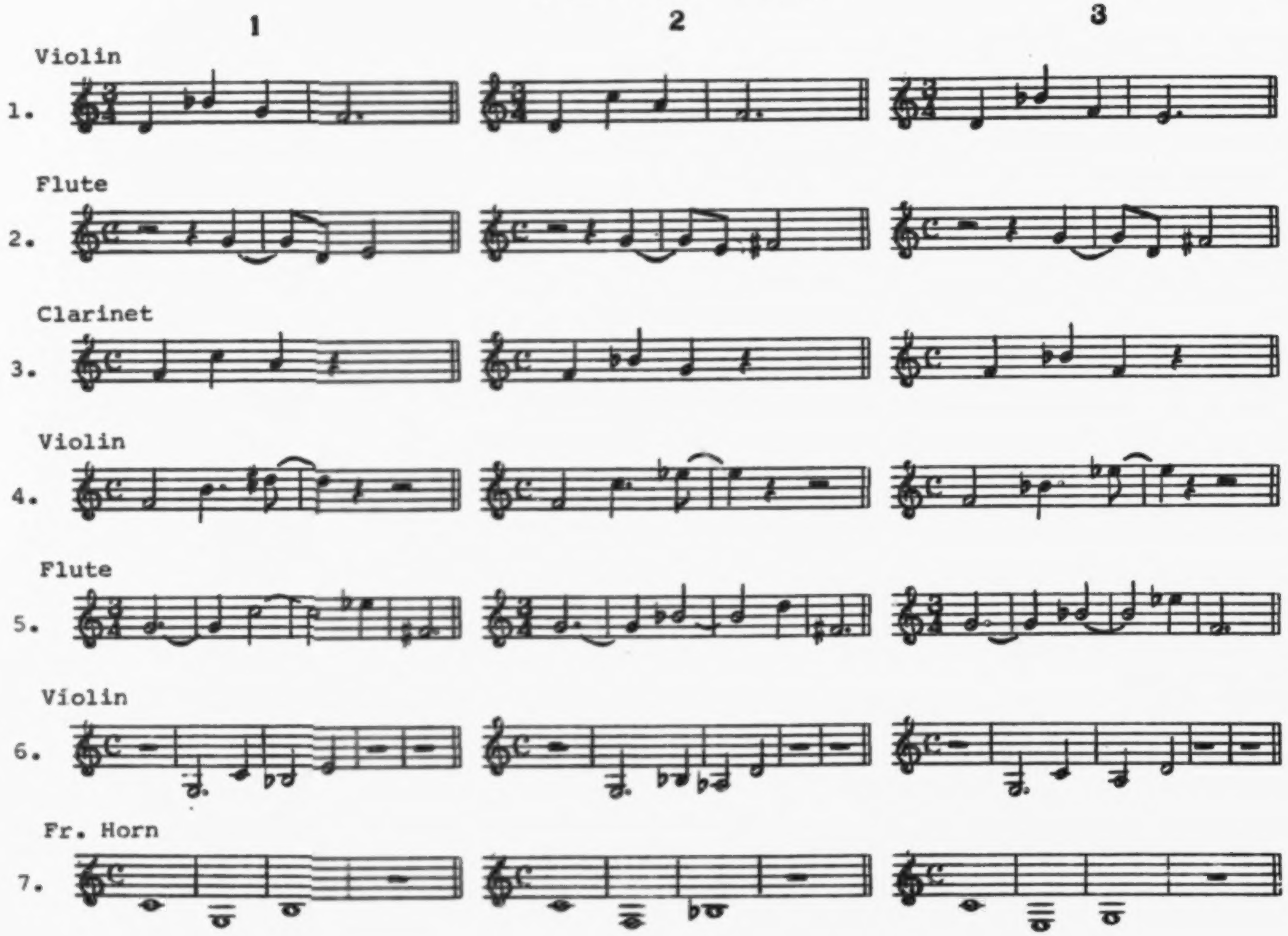




PRETEST-POSTTEST

Selected Response - Visual
3 to 4 Note Melodies

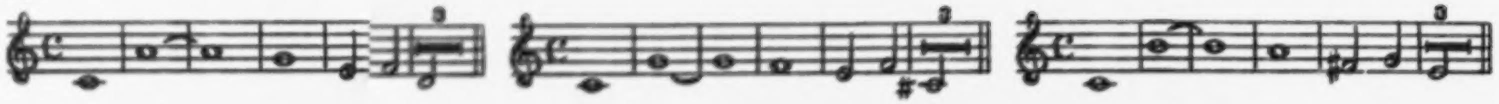

1
2
3
Violin
1.
Flute
2.
Clarinet
3.
Violin
4.
Flute
5.
Violin
6.
Fr. Horn
7.

PRETEST-POSTTEST

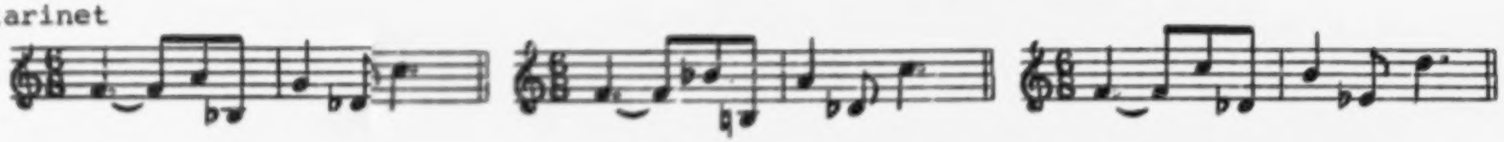
Selected Response - Visual
5 to 7 Note Melodies

1 2 3

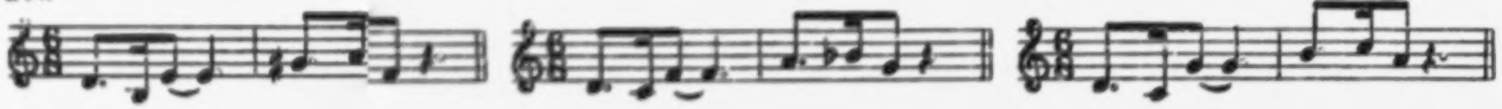
Flute

1. 

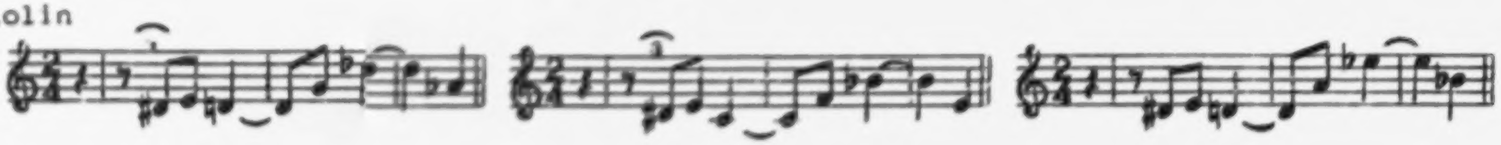
Clarinet

2. 

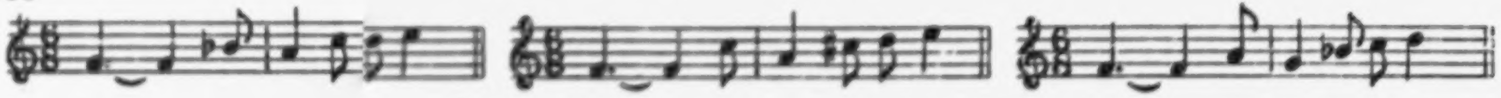
Flute

3. 

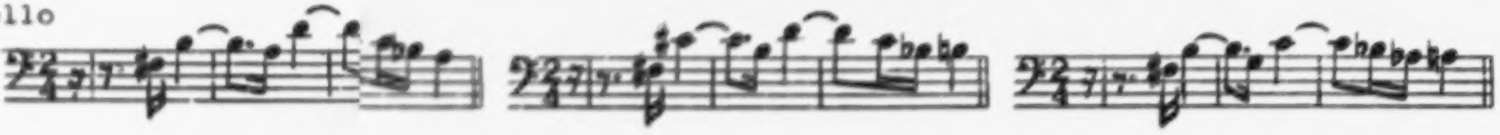
Violin

4. 

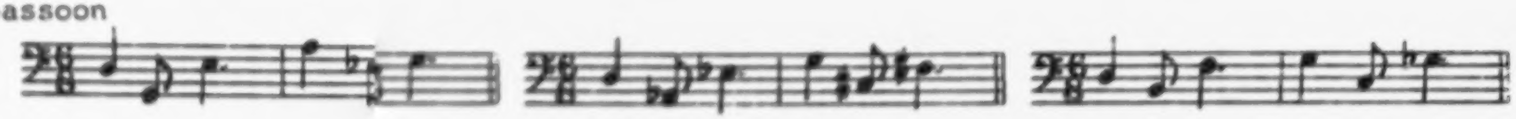
Oboe

5. 

cello

6. 

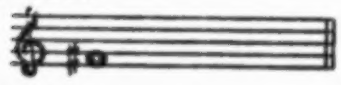
Bassoon

7. 

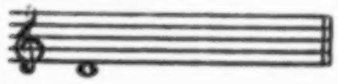
PRETEST-POSTTEST

Written Response

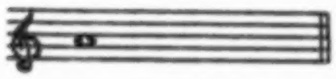
Violin

1. 

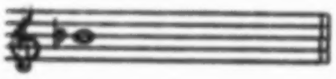
Fr. Horn

2. 

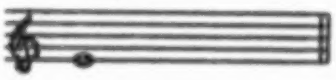
Flute

3. 

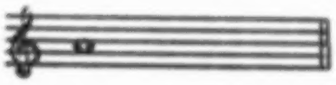
Violin

4. 

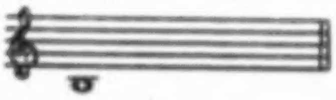
Fr. Horn

5. 

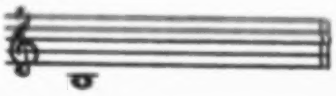
Oboe

6. 

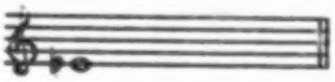
Fr. Horn

7. 

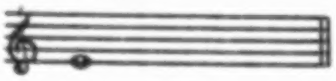
Violin

8. 

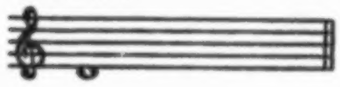
Fr. Horn

9. 

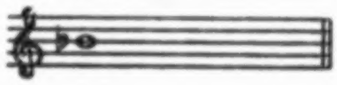
Fr. Horn

10. 

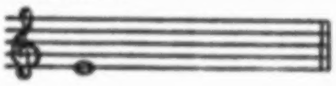
Clarinet

11. 

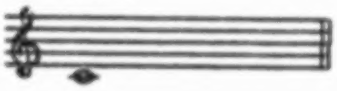
Fr. Horn

12. 

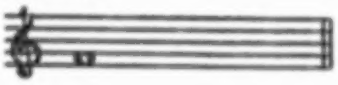
Clarinet

13. 

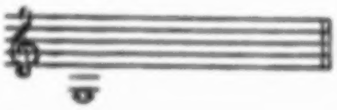
Clarinet

14. 

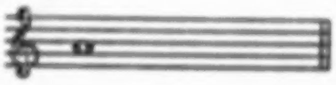
Violin

15. 

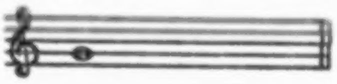
Fr. Horn

16. 

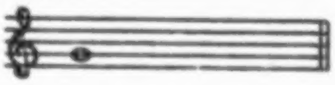
Violin

17. 

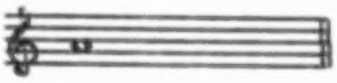
Fr. Horn

18. 

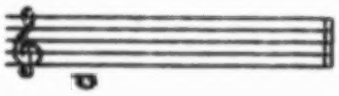
Viola

19. 

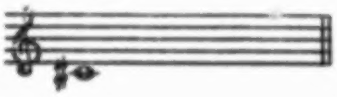
Violin

20. 

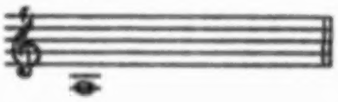
Oboe

21. 

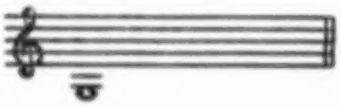
Fr. Horn

22. 

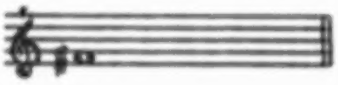
Fr. Horn

23. 

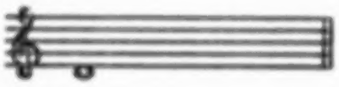
Violin

24. 

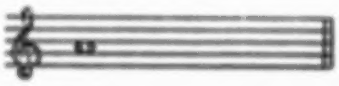
Fr. Horn

25. 

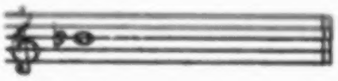
Viola

26. 

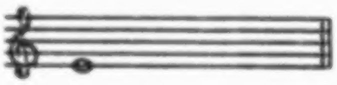
Fr. Horn

27. 

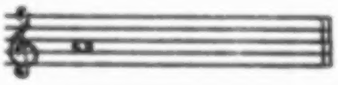
Clarinet

28. 

Fr. Horn

29. 

Oboe

30. 

PRETEST-POSTTEST
Vocal Response

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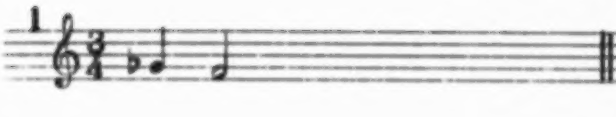

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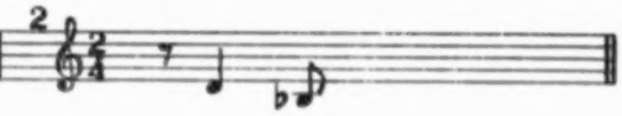

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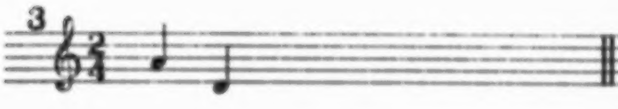

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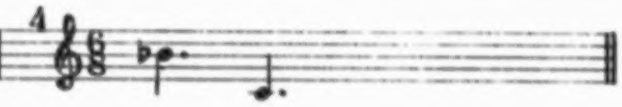

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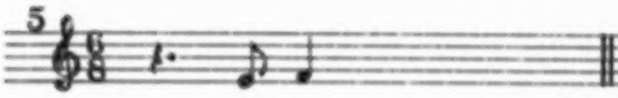

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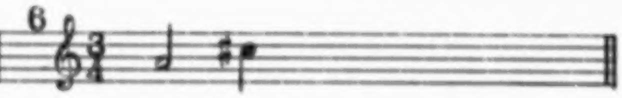

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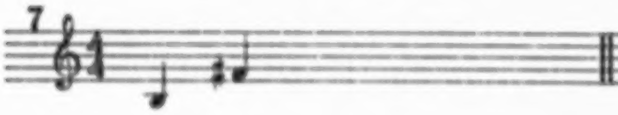

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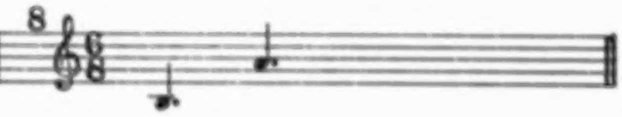

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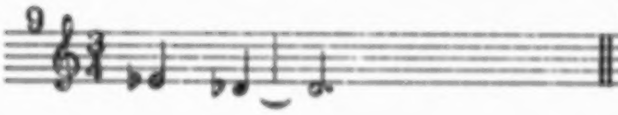

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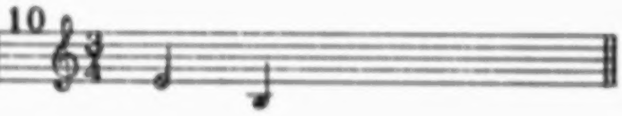

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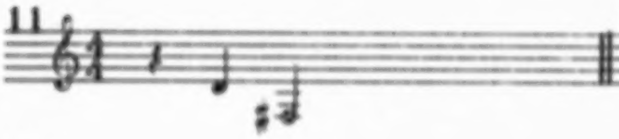

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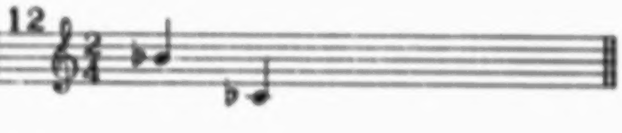

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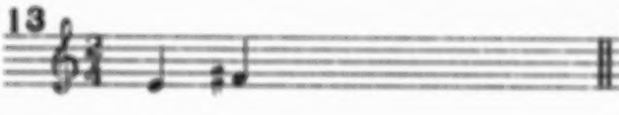

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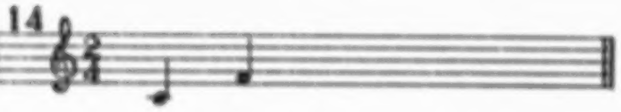

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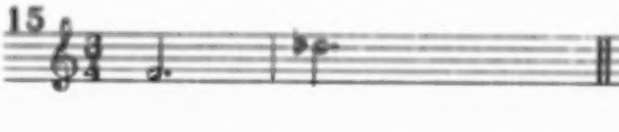

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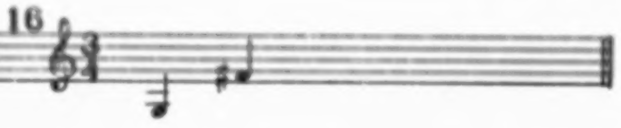

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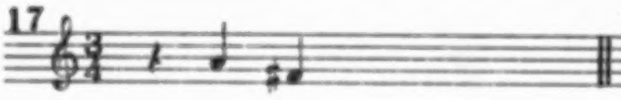

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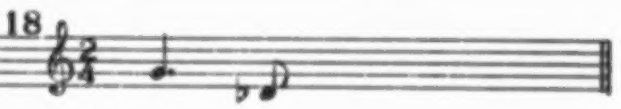

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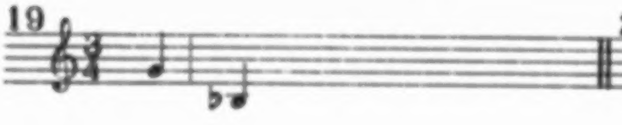

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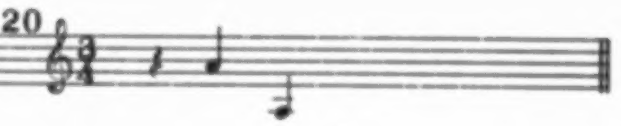
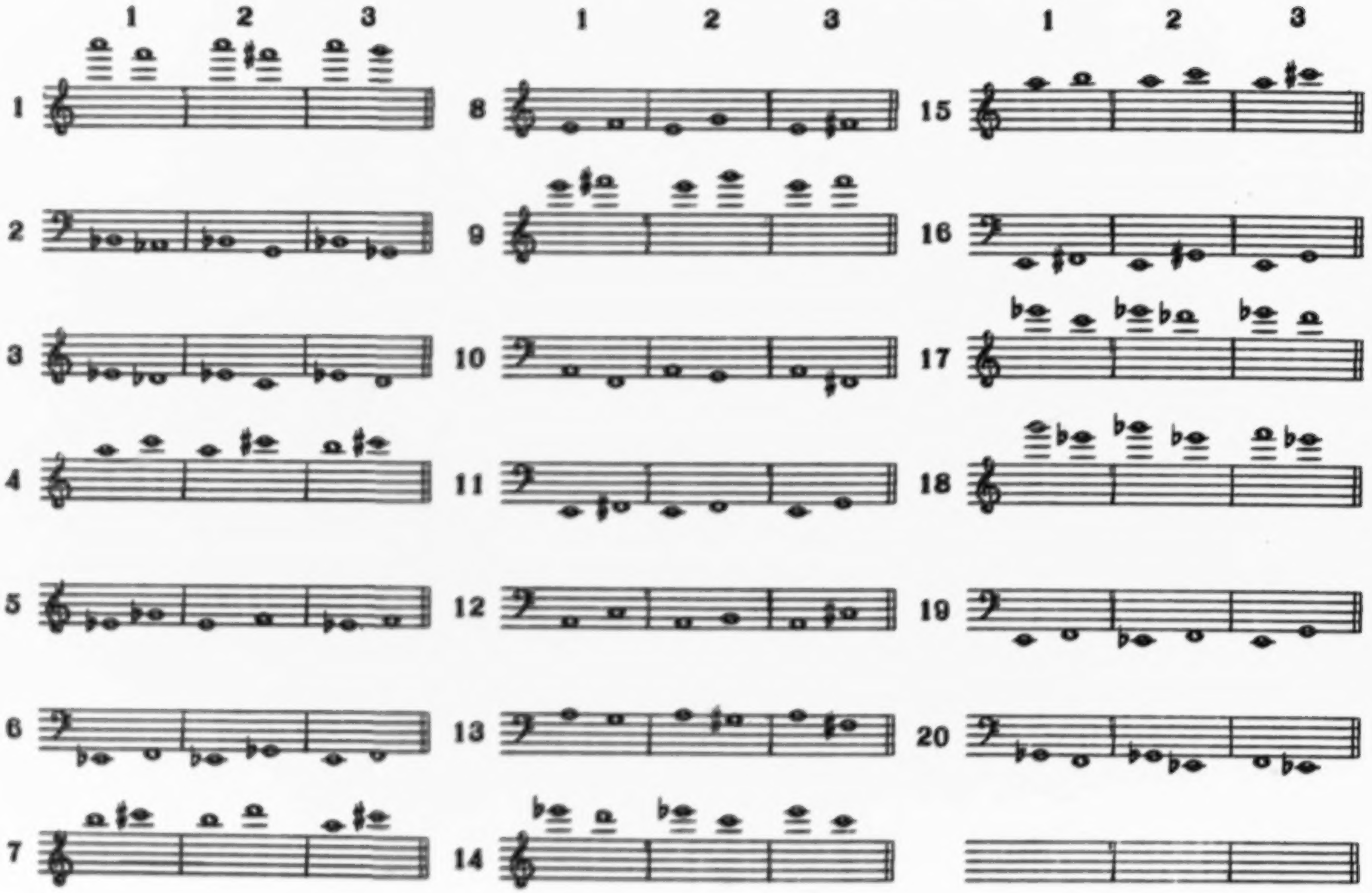


Tape Code 1 A-SR-V 2

Exercise - M3, m3, M2, m2

Name ______________________________

Section ________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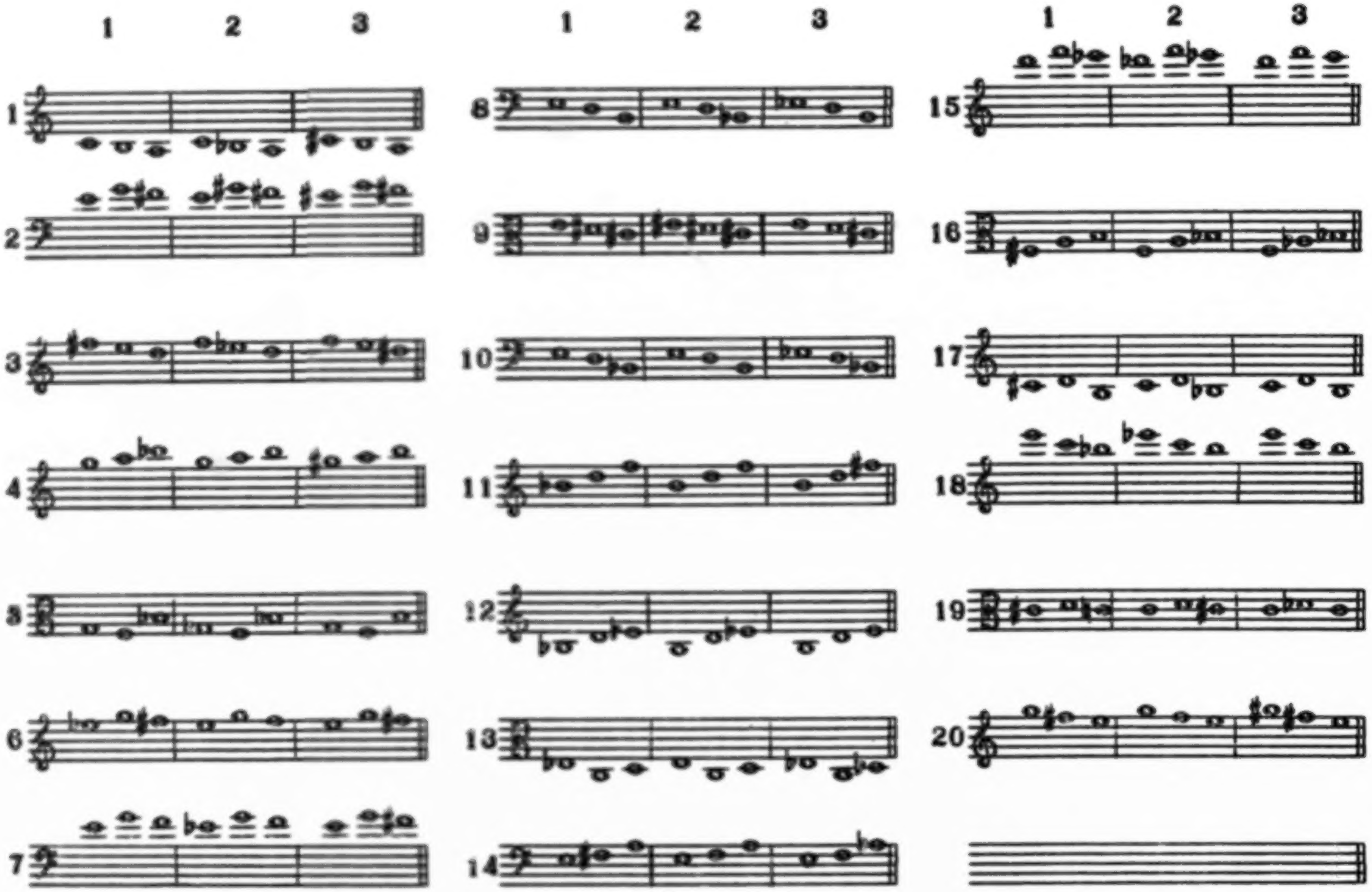
Tape Code 1 T-SR-V 4

Name ______________________

Exercise - 3 note melodies containing M3, m3, M2, m2

Section _____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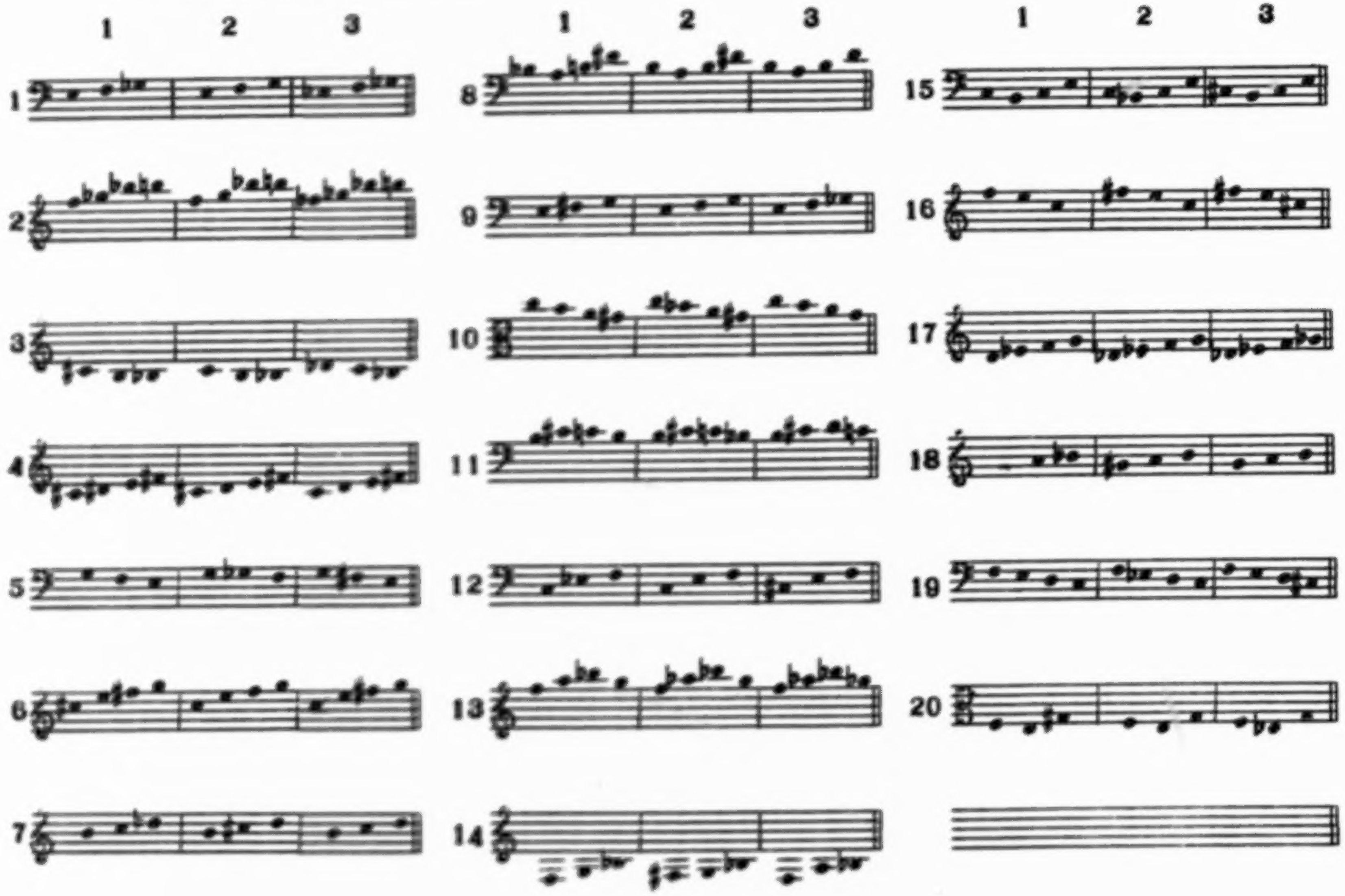
Tape Code 1 A-SR-V 6

Name ______________________

Self-Administered Test - 3 and 4 note melodies
containing: M3, m3, M2 & m2

Section ______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Tape Code 1 A-SR-V 5

Exercise - 4 note melodies containing M3, m3, M2, m2

Name ______________________________

Section __________

1 2 3

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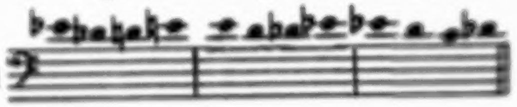

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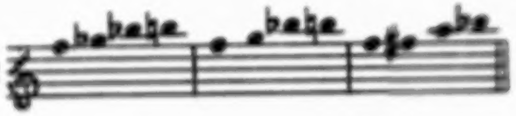

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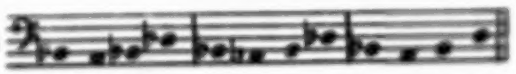

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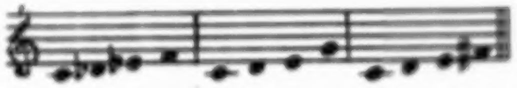

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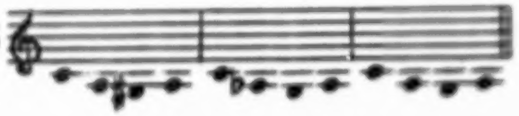

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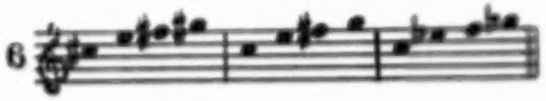

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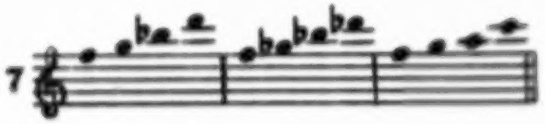

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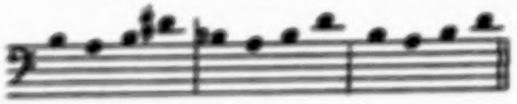

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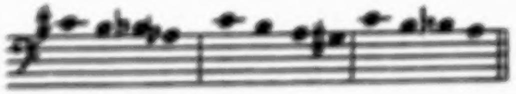

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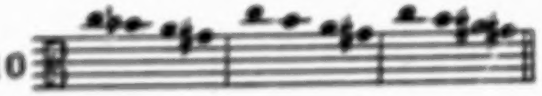

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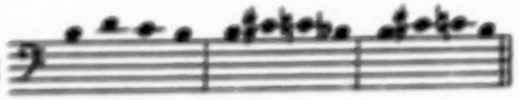

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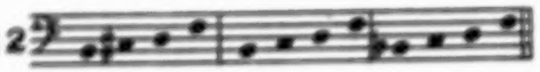

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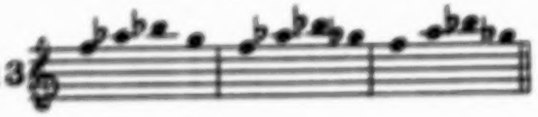

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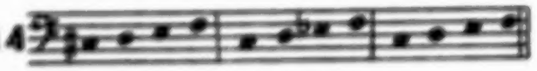

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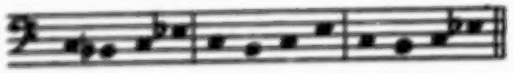

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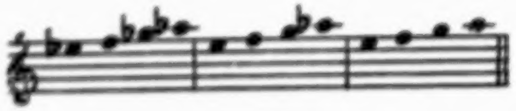

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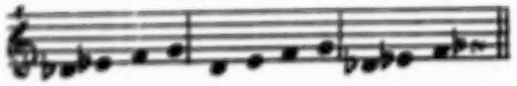

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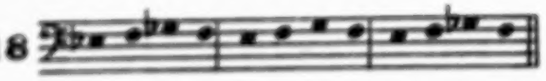

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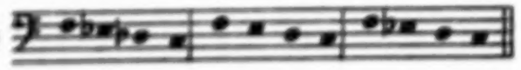

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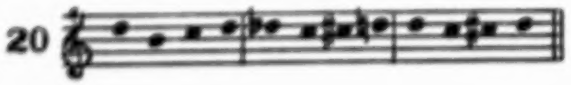

Tape Code 2 A-CR-A 2 Name ____________________

Exercise - 0 _____ X ____ Section _____

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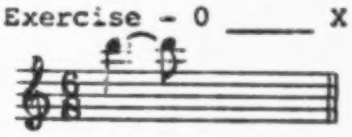

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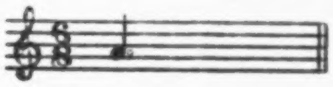

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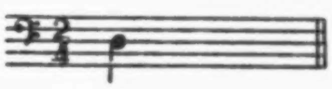

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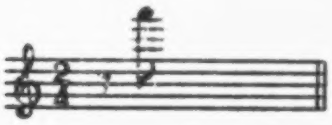

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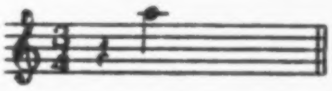

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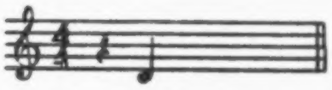

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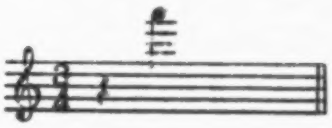

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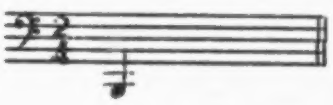

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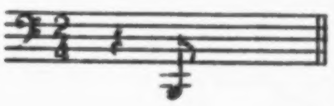

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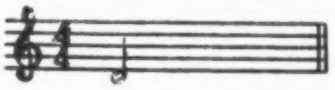

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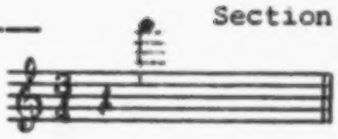

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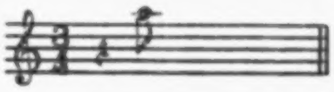

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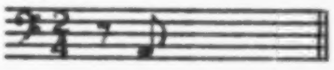

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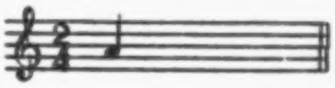

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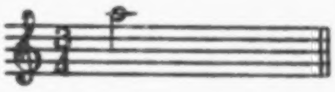

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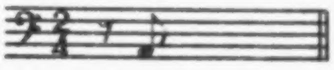

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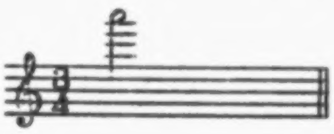

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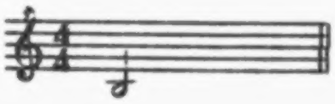

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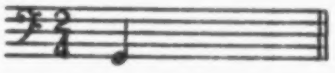

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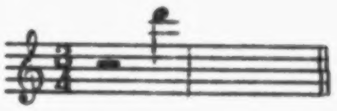
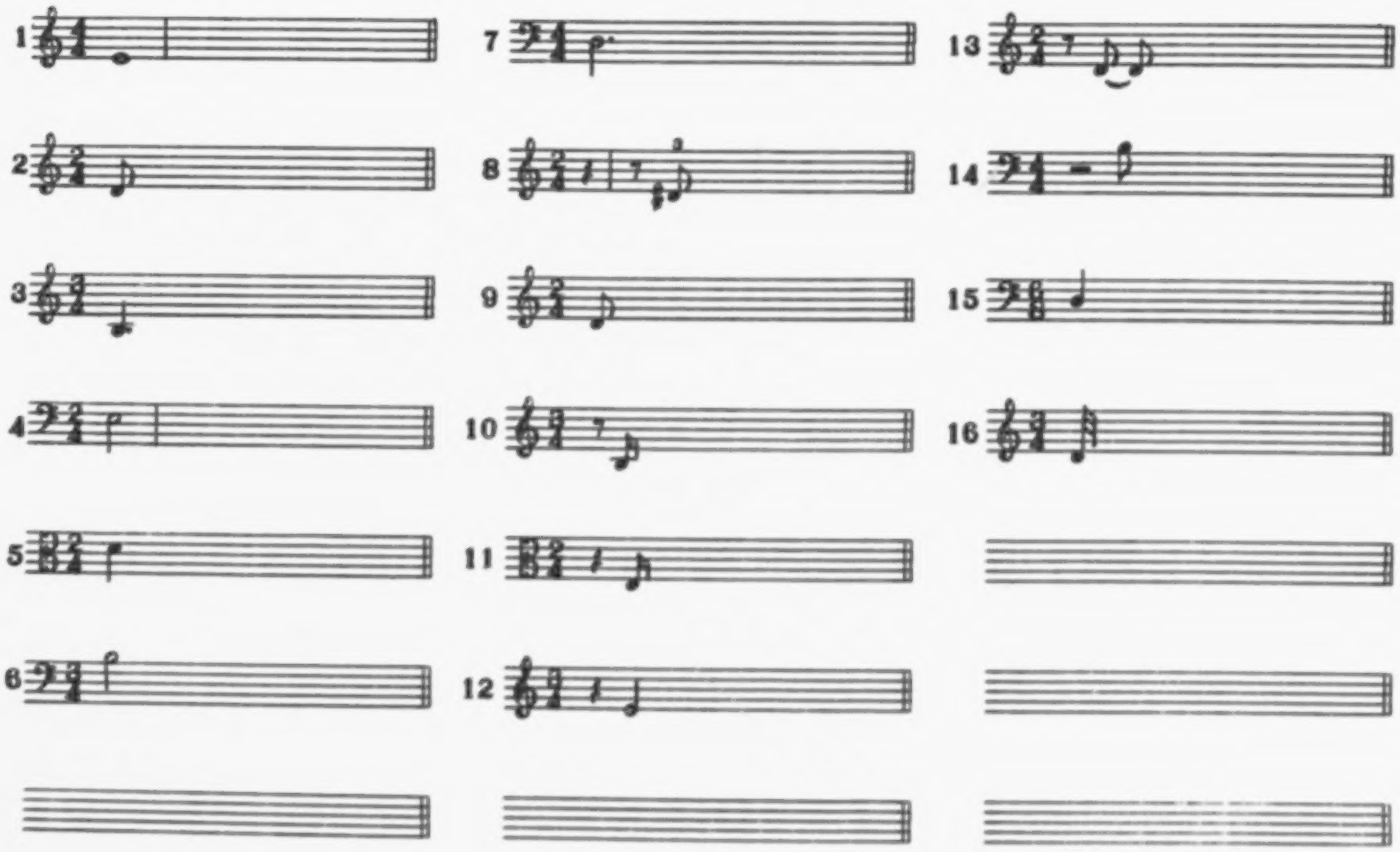


Tape Code 2 A-CR-A 7

Exercise - 0 _____ X _____ / _____

Name ___________________________ Sec.______

Contents: 3 to 6 note melodies using m2, M2, m3, M3, P4, P5, TT, m6 & M6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VOCAL RESPONSE - Tape Code 1 A-VR-V 4 Contents: M3, m3

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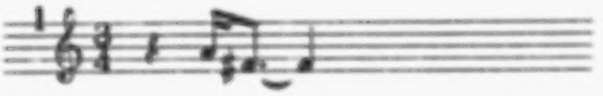

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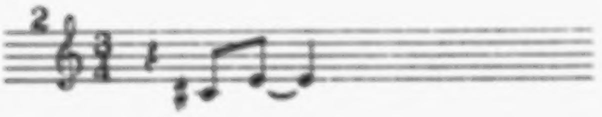

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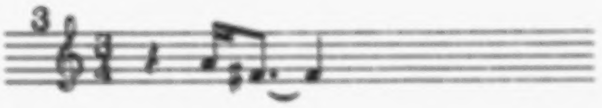

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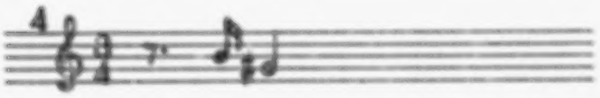

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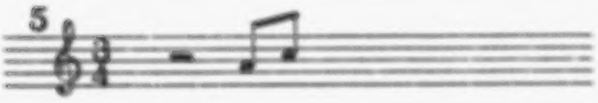

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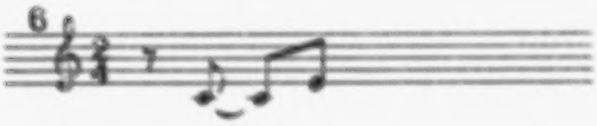

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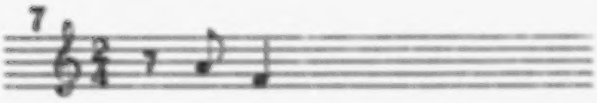

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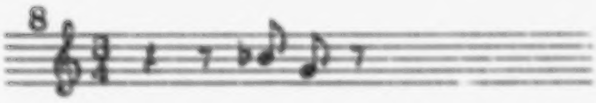

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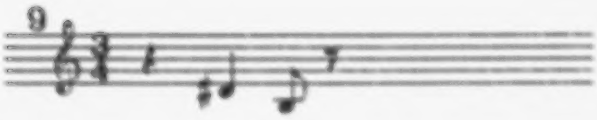

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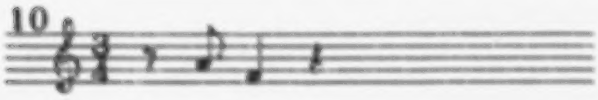

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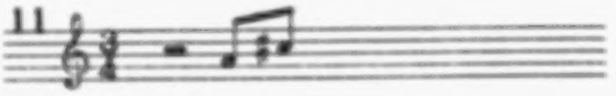

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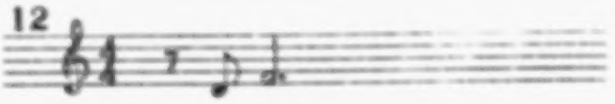

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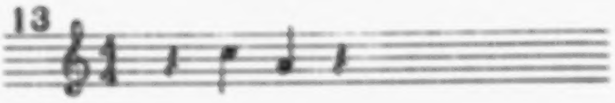

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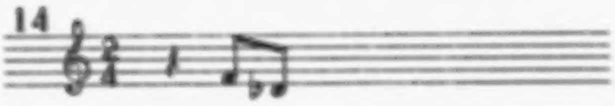

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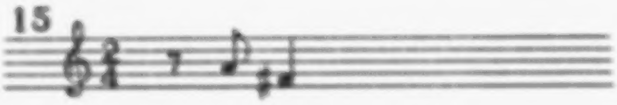

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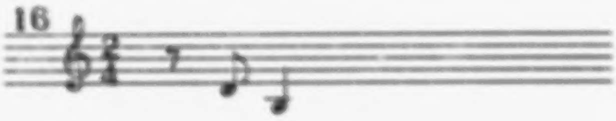

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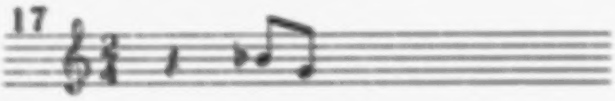

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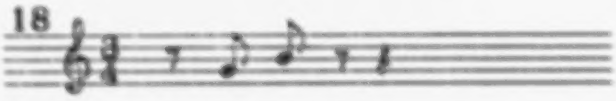

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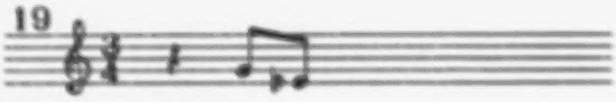

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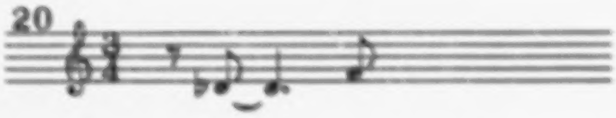

VOCAL RESPONSE - 1 T-VR-V 7 Contents: 3 note melodies(M2,m2,M3,m3)

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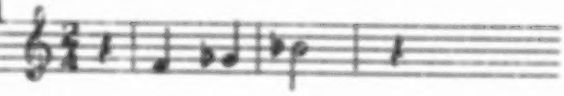

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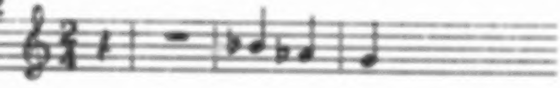

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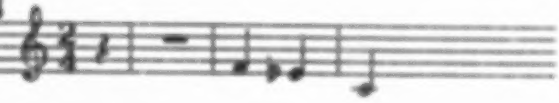

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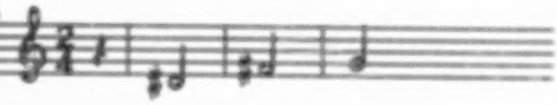

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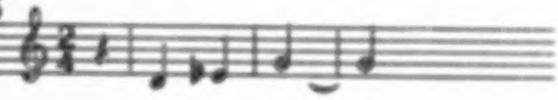

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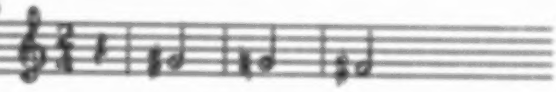

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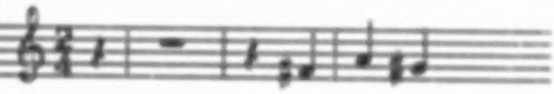

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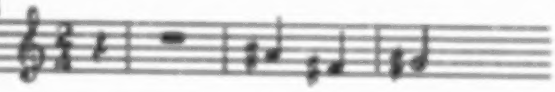

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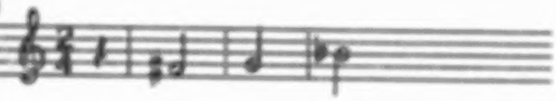

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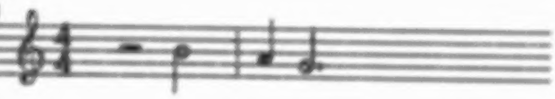

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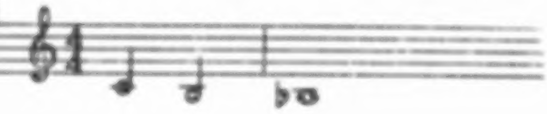

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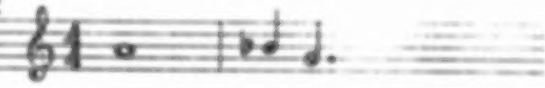

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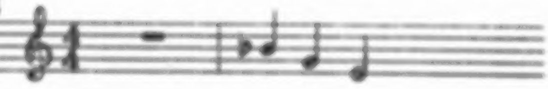

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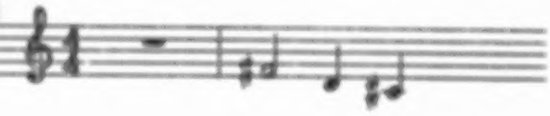

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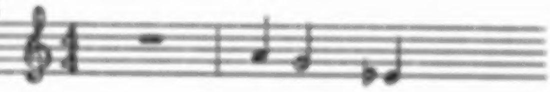

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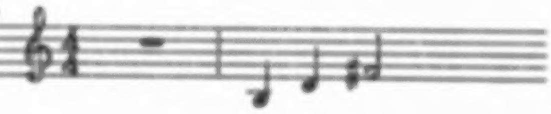

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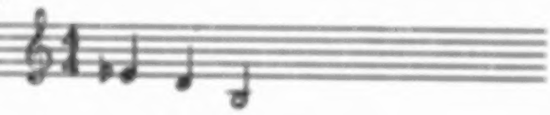

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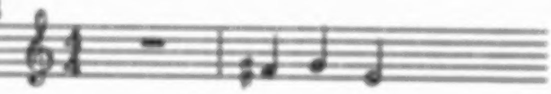

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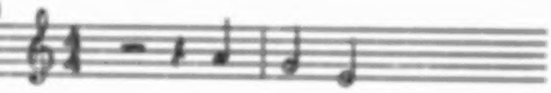

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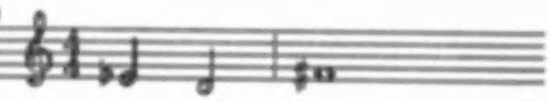

PRE-TEST DESIGN

Realizing that the entering student would have limited ability in solving problems requiring a previously learned terminology and a comprehension of sight/sound associations, it was decided to restrict the portion of the pre-test requiring such previous learning to what would be essential to a valid measure of the student's abilities. Therefore, the portion of the test containing the most complete coverage of intervals and melody within all the conditions of range, direction, and accompaniment had to be constructed so as to measure the student's capacity to judge the relative sizes of intervals or relative shapes of melody without the necessity of using musical terminology or dealing with the intricacies of musical notation. The first five tests of the series were of this nature.

Test number one of the series contained 144 problems requiring a selected response to an aural stimulus: the student's only task was to make an aural judgement concerning the relative sizes of intervals. Each of the twelve intervals, including the octave,* was used in ascending and descending form. Each of these was used in an high, medium, and low pitch range along with one other voice in both tonal and atonal settings. Each problem was composed of three items with one of the three containing the interval for which the problem was made. If, as in the example below, the interval of the item which was the correct answer were an ascending M3 played in the high range by the flute, the other two items would contain an interval near the size of the M3, let us say a P4, played by the flute.

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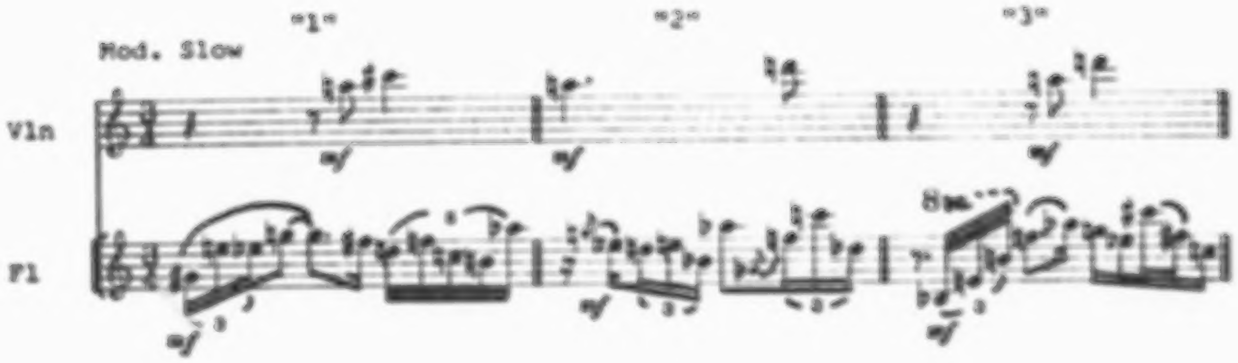
*The octave is generally considered a repeated pitch class rather than an interval.



Upon hearing the problem played, the student would select the one interval that differed from the other two and indicate his selection by making the appropriate mark on the mark-sensing form designed for this type of response.* The problems were randomly arranged from the standpoint of interval type, direction, and as to whether the setting were tonal or atonal. The problems were arranged in groups of five in terms of high, medium, or low range. The total range covered was from contra E to b . The instrumentation of the intervals within each problem remained the same as would be necessary; however, the instrumentation from problem to problem within a given pitch range was done at random at the time the problems were composed. The instrumentation of the accompanying voice remained the same within each problem also; however, the accompanying instrument was not restricted to a given range within a given problem. From problem to problem, the instrumentation of the accompanying voice was randomly selected at the time the problems were composed.

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*To increase the assurance that the nature and form of the problems were properly understood by each student and that there would be no difficulties with the recognition of the timbres of the ten instruments used in the test, the term "interval" was adequately explained and a series of sample problems utilizing all ten instruments was presented in a taped half-hour demonstration.

Tests number two and three were the same in content and format as test number one with the following exceptions: test number two provided a two voice accompaniment for the intervals and test number three provided a four voice accompaniment. The increase in the number of accompanying voices generally increased the distraction element, added to the possible confusion of timbres, and rendered the designated instrument less audible.*

Test number four continued to require a selected response to an aural stimulus and retained the problem format of the previous tests but moved on to increased difficulty. Rather than the interval as the subject for comparison, short melodies of three to four notes were used. In two of the items of a problem, the designated instrument played brief melodies having the same interval series. The melody in the remaining item of the problem had a different interval series resulting from a change in one or more of its pitches. The melodic contour, however, remained the same. The student selected the one melody that differed in its interval series from the other two and indicated his choice on the mark-sensing form. The test contained sixty problems, half tonal and half atonal. Each group of thirty was further divided having ten with one accompanying voice, ten with two accompanying voices, and ten with four. Each group of ten had five of the problem melodies presented in a medium high range and five in a medium low range with the point of division around middle "C". Within each problem, the instrumentation of the problem melody remained the same; but a variety of instruments was used from problem to problem. The accompanying voices were scored in two different ways: in half the problems, the scoring remained the same for each of the three items; in the remaining half, the scoring was different for each of the three items. The problems were randomly arranged from the standpoint of there being three or four notes in the problem melody, as to whether they were tonal or atonal, and in regard to the scoring of the accompanying voices. The problems were presented in groups, however, according to the number of accompanying voices.

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*In a few instances the designated instrument was nearly or completely masked because of poor balance in the recording.

Test number five was identical in all respects to test number four with the exception that the problem melodies contained five to seven notes. The problems in both melody tests were generally longer, and thus memory became increasingly more important as a factor contributing to the increase of difficulty.

At this point in the test series, all the accompanied musical materials to be used in the pre-test had been presented; and in all subsequent tests, problems using accompanied intervals or melodies were constructed from these materials. For test number six, the medium range problems from test number one served as the source. The items used were just those containing the intervals for which the problems of test one were made. The test contained 48 problems requiring a selected response to a visual stimulus. Upon hearing the interval, the student selected the one written interval that matched from among the three given. The student indicated his selection by checking the answer he considered correct. Tests number seven and eight were identical to test number six in all respects with the exception that test number six presented the intervals accompanied by two other voices and test number seven presented the intervals accompanied by four other voices. The materials for tests number seven and eight were drawn from tests two and three respectively.

Tests number nine and ten also required a selected response to a visual stimulus. Twenty of the items containing problem melodies (i.e., the melody that was the correct answer) from test number four were used in test number seven, and twenty of the items containing problem melodies from test number five were used in test number eight. Each group of twenty contained ten tonal problems and ten atonal problems. Each group of ten contained five in a medium low range and five in a medium high range. Within each test, the problems were randomly arranged.

Tests number eleven and twelve required a constructed-written response to an aural stimulus. The 48 problems of test number eleven utilized selected items from tests number one, two, and three containing the medium range problem intervals. In choosing the items, care was taken to include one each of the intervals in both ascending and descending form in both tonal and atonal settings. Within the tonal and atonal groups, relatively equal numbers of one, two, and four voice accompaniments were used. Within the test, the problems were randomly arranged. Test number twelve was comprised of 20 problems utilizing selected items containing the problem melodies from tests number four and five. In choosing the items, care was taken to select ten tonal settings and ten atonal settings. Each group of ten had five in the medium high range and five in the medium low range. Within the groups of five, relatively equal numbers of 3-4 note and 5-7 note melodies were used. Within the test, the problems were randomly arranged.

Test number thirteen required a selected response to an aural stimulus and was the only portion of the total pre-test to contain unaccompanied materials. The test contained 144 problems, and each problem contained three items. Two of the items were intervals of the same size and direction but which began on different pitches. The third item was the interval for which the problem was made; it was close to the size of the other two and began on a pitch different from that of either of the other two intervals. As in test one, all twelve intervals were used in both ascending and descending forms. Each of these was used in high, medium, and low ranges in both tonal and atonal organizations. Tonal organization was achieved by forming the three intervals from the pitches available in the scale patterns and vertical structures found in tonal music. Atonal organization was achieved by forming the three intervals from pitches unrelated to any scale patterns or vertical structures found in tonal music. In this test the student was to select the one interval that differed in size from the other two. Since each of the intervals within a problem began on a different pitch and each was notated with different time values, comparison was more difficult than in tests one, two, and three.

The final test, number fourteen in the series, required a constructed-vocal response to a visual stimulus. The 48 problems which were randomly arranged utilized selected items from tests one, two, and three containing the medium range problem intervals. The ascending and descending forms of each of the twelve intervals were selected, one each from the tonal and atonal problems. The intervals which the students were required to sing were notated on staff paper. These intervals were, of course, not recorded in sound; the students were given the beginning pitches and heard only the accompaniment with which they were to sing.

The vocal response test had to be given individually using the laboratory equipment designed for vocal response drill. Since uniform judgements were required in correcting the test and since people would vary in their judgements as to how far a pitch could be out of tune before it would be considered a different pitch, one person corrected both the pre-test and post-test. A concise outline of the pre-test follows.

OUTLINE OF PRE-TEST

PART I - SELECTED RESPONSE to an AURAL STIMULUS

Test 1. Intervals Accompanied by One Other Voice

Tonal		Atonal	
Up	Down	Up	Down
High - 12	High - 12	High - 12	High - 12
Med. - 12	Med. - 12	Med. - 12	Med. - 12
Low - 12	Low - 12	Low - 12	Low - 12
36	36	36	36

total - 144

Test 2. Intervals Accompanied by Two Other Voices

Tonal		Atonal	
Up	Down	Up	Down
High - 12	High - 12	High - 12	High - 12
Med. - 12	Med. - 12	Med. - 12	Med. - 12
Low - 12	Low - 12	Low - 12	Low - 12
36	36	36	36

total - 144

Test 3. Intervals Accompanied by Four Other Voices

Tonal		Atonal	
Up	Down	Up	Down
High - 12	High - 12	High - 12	High - 12
Med. - 12	Med. - 12	Med. - 12	Med. - 12
Low - 12	Low - 12	Low - 12	Low - 12
36	36	36	36

total - 144

Test 4. Three to Four Note Melodies Accompanied by One Other Voice

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

Three to Four Note Melodies Accompanied by Two Other Voices

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

Three to Four Note Melodies Accompanied by Four Other Voices

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

Test 5. Five to Seven Note Melodies Accompanied by One Other Voice

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

Five to Seven Note Melodies Accompanied by Two Other Voices

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

Five to Seven Note Melodies Accompanied by Four Other Voices

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

PART II - SELECTED RESPONSE to a VISUAL STIMULUS

Test 6. Intervals Accompanied by One Other Voice

Tonal		Atonal	
Up	Down	Up	Down
Med. - 12	Med. - 12	Med. - 12	Med. - 12

total - 48

Test 7. Intervals Accompanied by Two Other Voices

Tonal		Atonal	
Up	Down	Up	Down
Med. - 12	Med. - 12	Med. - 12	Med. - 12

total - 48

Test 8. Intervals Accompanied by Four Other Voices

Tonal		Atonal	
Up	Down	Up	Down
Med. - 12	Med. - 12	Med. - 12	Med. - 12

total - 48

Test 9. Three to Four Note Melodies Accompanied by One, Two, and Four Other Voices

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

Test 10. Five to Seven Note Melodies Accompanied by One, Two, and Four Other Voices

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total 20

PART III - CONSTRUCTED-WRITTEN RESPONSE to an AURAL STIMULUS

Test 11. Intervals Accompanied by One, Two, and Four Other Voices

Tonal		Atonal	
Up	Down	Up	Down
Med. - 12	Med. - 12	Med. - 12	Med. - 12

total - 48

Test 12. Three to Four Note Melodies Accompanied by One, Two, and Four Other Voices

Tonal		Atonal	
High - 5	Low - 5	High - 5	Low - 5

total - 20

PART IV - SELECTED RESPONSE to an AURAL STIMULUS

Test 13. Isolated Intervals

Tonal		Atonal	
Up	Down	Up	Down
High - 12	High - 12	High - 12	High - 12
Med. - 12	Med. - 12	Med. - 12	Med. - 12
Low - 12	Low - 12	Low - 12	Low - 12
36	36	36	36

total - 144

PART V - CONSTRUCTED-VOCAL RESPONSE TO AN AURAL STIMULUS

Test 14. Intervals Accompanied by One, Two, and Four Other Voices

Tonal		Atonal	
Up	Down	Up	Down
Med. - 12	Med. - 12	Med. - 12	Med. - 12

total 48

INDICES of DIFFICULTY and DISCRIMINATION

TEST 1

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1	.81	.31	21	.78	.19
2	.52	.42	22	.92	.15
3	.88	.23	23	0	0
4	.50	.31	24	.77	.31
5	.88	.23	25	.75	0
6	.75	.42	26	.65	.19
7	.77	.23	27	.23	-.15
8	.98	.04	28	.92	.08
9	.94	.12	29	.73	.46
10	.45	.12	30	.79	.12
11	.81	.38	31	.77	.23
12	.94	.12	32	.92	.15
13	.94	.46	33	.65	.54
14	.67	.58	34	.75	.50
15	.61	.38	35	.60	.65
16	.77	.38	36	.63	-.04
17	.92	.15	37	.85	.23
18	.28	.19	38	.69	.23
19	.96	.07	39	.98	.04
20	.62	.46	40	.90	.12

TEST 1 (cont.)

Item No.	Difficulty	Discrimination
41	.83	.27
42	.75	.35
43	.81	.31
44	.88	.08
45	.75	.15
46	.15	-.23
47	.40	.27
48	.60	.42
49	.90	.19
50	.37	-.04
51	.87	.27
52	.96	.08
53	.85	.23
54	.81	.23
55	.63	.42
56	.28	-.27
57	.56	.42
58	.63	.35
59	.73	.23
60	.28	.04
61	.77	.23
62	.44	.42
63	.31	.15
64	.17	.12
65	.92	.15
66	.90	.19
67	.90	.12
68	.92	.15
69	.46	.54
70	.77	.38
71	.44	.12
72	.58	.23
73	.46	0
74	.81	.23
75	.75	.50
76	.90	.19
77	.57	.35
78	.75	.50
79	.94	.12
80	.96	0
81	.98	.04
82	.98	.04

TEST 1 (cont.)

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
83	.88	.23	104	.94	.12
84	.79	.42	105	.67	.12
85	.67	.42	106	.81	.15
86	.54	.15	107	.75	.35
87	.58	.23	108	.56	.19
88	.35	.15	109	.56	.12
89	.60	.42	110	.88	.23
90	.90	.19	111	.87	.27
91	.54	.38	112	.94	.12
92	.79	.12	113	.77	.38
93	.12	.15	114	.87	.19
94	.79	.35	115	.96	.08
95	.48	.42	116	.87	.19
96	.69	.46	117	.73	.46
97	.88	.15	118	.69	.15
98	.77	.38	119	.71	.04
99	.65	.31	120	.55	.69
100	.35	.15	121	.67	.50
101	.63	.50	122	.94	.12
102	.62	.23	123	.69	.46
103	.52	.27	124	.87	.27

TEST 1 (concl.)

Item No.	Difficulty	Discrimination
125	.73	.54
126	.67	.42
127	.87	.27
128	.90	.19
129	.75	.19
130	.85	.31
131	.88	.15
132	.62	.62
133	.69	.46
134	.83	.27
135	.60	.27
136	.83	.12
137	.56	.42
138	.67	.50
139	.90	.04
140	.79	.42
141	.71	.35
142	.73	.42
143	.90	.12
144	.63	.42

TEST 2

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1	.43	.28	21	.88	.16
2	.88	.08	22	.68	.56
3	.90	.20	23	.49	.32
4	.90	.20	24	.80	.32
5	.92	.16	25	.67	.20
6	.74	.44	26	.38	.20
7	.92	.16	27	.60	.40
8	.62	.28	28	.52	.24
9	.68	.32	29	.58	.20
10	.58	.28	30	.60	.40
11	.64	.32	31	.78	.28
12	.52	.32	32	.12	-.16
13	.54	.44	33	.82	.36
14	.58	.52	34	.42	.44
15	.70	.20	35	.54	-.04
16	.38	-.36	36	.82	.36
17	.16	.08	37	.72	.40
18	.74	.36	38	.76	.24
19	.82	.28	39	.82	.36
20	.62	.28	40	.78	.36

TEST 2 (cont.)

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
41	.46	.20	62	.80	.24
42	.52	.32	63	.82	.20
43	.62	-.12	64	.60	.08
44	.40	.36	65	.68	.40
45	.18	-.04	66	.84	.24
46	.76	.24	67	.46	.12
47	.70	.36	68	.94	.12
48	.60	.40	69	.72	.16
49	.78	.36	70	.80	.24
50	.76	.40	71	.74	.28
51	.78	.36	72	.84	.32
52	.66	.52	73	.70	.44
53	.24	0	74	.18	-.12
54	.82	.36	75	.43	.44
55	.34	.04	76	.88	.24
56	.82	.28	77	.94	.12
57	.40	.24	78	.42	.04
58	.37	.24	79	.86	.28
59	.26	.20	80	.22	.20
60	.49	.48	81	.86	.24
61	.65	.08	82	.80	.20

TEST 2 (cont.)

Item No.	Diffi-culty	Discrimi-nation	Item No.	Diffi-culty	Discrimi-nation
83	.63	.52	104	.33	0
84	.90	.24	105	.44	.64
85	.71	.36	106	.88	.16
86	.63	.36	107	.88	.16
87	.69	.32	108	.35	.04
88	.73	.48	109	.48	.48
89	.69	.08	110	.86	.12
90	.63	.44	111	.90	.04
91	.69	.56	112	.68	.40
92	.46	-.04	113	.90	.04
93	.80	.32	114	.74	.28
94	.38	.28	115	.44	.64
95	.16	0	116	.46	.44
96	.32	-.16	117	.54	.52
97	.92	.08	118	.62	.76
98	.64	.48	119	.74	.28
99	.76	.24	120	.58	.36
100	.78	.36	121	.86	.20
101	.72	.56	122	.80	.32
102	.78	.20	123	.40	.08
103	.66	.52	124	.38	.28

TEST 2 (concl.)

Item No.	Diffi-culty	Discrimi-nation
125	.80	.24
126	.84	.16
127	.78	.28
128	.84	.24
129	.90	.20
130	.80	.40
131	.28	.16
132	.48	.16
133	.56	.32
134	.94	.08
135	.34	.20
136	.88	.24
137	.78	.36
138	.80	.40
139	.92	.08
140	.50	.12
141	.45	.40
142	.50	.68
143	.50	.12
144	.34	.20

TEST 3

Item No.	Diffi-culty	Discrimi-nation	Item No.	Diffi-culty	Discrimi-nation
1	.73	.27	22	.80	.32
2	.86	.23	23	.66	.50
3	.23	.27	24	.25	.32
4	.73	.36	25	.40	.14
5	.64	.64	26	.45	.27
6	.70	.41	27	.39	.23
7	.77	.36	28	.41	-.09
8	.57	.59	29	.89	.23
9	.80	.41	30	.50	.27
10	.70	.50	31	.36	.18
11	.70	.59	32	.43	.05
12	.14	.09	33	.50	.55
13	.77	.45	34	.45	.36
14	.41	.18	35	.25	.05
15	.43	.59	36	.64	.36
16	.52	.68	37	.75	.23
17	.70	.32	38	.43	.23
18	.68	.45	39	.44	.05
19	.68	.18	40	.52	.23
20	.86	.27	41	.52	.59
21	.56	.18	42	.68	.36

TEST 3 (Cont.)

Item No.	Diffi-culty	Discrimi-nation	Item No.	Diffi-culty	Discrimi-nation
43	.86	.27	63	.77	.18
44	.25	.32	64	.16	-.23
45	.61	.32	65	.93	.14
46	.68	.55	66	.80	.41
47	.18	.09	67	.61	.41
48	.75	.41	68	.48	.05
49	.25	.05	69	.49	.41
50	.70	.23	70	.32	.18
51	.73	.45	71	.27	.18
52	.59	.64	72	.68	.09
53	.34	.32	73	.64	.36
54	.75	.41	74		
55	.89	.23	75	.70	.23
56	.59	.36	76	.41	.09
57	.59	.36	77	.70	.50
58	.36	.27	78	.61	.50
59	.72	.41	79	.84	.32
60	.39	.41	80	.68	.45
61	.55	0	81	.64	-.09
62	.18	.09	82	.86	.27

TEST 3 (cont.)

Item No.	Diffi-culty	Discrimi-nation	Item No.	Diffi-culty	Discrimi-nation
83	.50	.36	103	.64	.55
84	.86	.27	104	.36	.27
85	.82	.27	105	.43	-.23
86	.73	.36	106	.64	.45
87	.64	.55	107	.70	.50
88	.20	-.14	108	.70	.50
89	.48	.05	109	.70	.50
90	.30	.05	110	.86	.18
91	.86	.27	111	.56	0
92	.93	.14	112	.59	.45
93	.52	.41	113	.68	.45
94	.73	.45	114	.32	0
95	.68	.27	115	.73	.55
96	.57	.50	116	.57	.59
97	.75	.41	117	.37	-.18
98	.23	.18	118	.34	.23
99	.89	.23	119	.66	.59
100	.84	.32	120	.52	.50
101	.77	.27	121	.73	.27
102	.59	.64	122	.50	.18

TEST 3 (concl.)

Item No.	Difficulty	Discrimination
123	.39	-.23
124	.32	.09
125	.75	.14
126	.34	-.14
127	.66	.50
128	.68	.36
129	.91	.18
130	.68	.09
131	.36	.36
132	.43	.50
133	.66	.41
134	.64	.55
135	.21	.23
136	.66	.50
137	.73	.36
138	.43	.14
139	.68	.45
140	.34	.32
141	.59	.27
142	.30	.23
143	.32	-.27
144	.30	.14

TEST 4

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1	.53	.59	31	.43	.26
2	.53	.30	32	.54	.04
3	.77	.33	33	.30	.15
4	.42	.22	34	.35	.33
5	.53	.22	35	.48	0
6	.47	.04	36	.59	.22
7	.32	.26	37	.20	.19
8	.39	-.04	38	.43	.26
9	.31	.19	39	.48	.22
10	.41	.37	40	.61	.19
11	.52	.44	41	.81	.15
12	.30	.22	42	.46	.48
13	.50	.33	43	.39	.41
14	.54	.33	44	.43	.33
15	.67	.22	45	.35	.11
16	.67	.37	46	.70	.30
17	.63	.30	47	.44	.15
18	.52	.15	48	.48	.22
19	.50	.19	49	.35	.33
20	.70	.30	50	.59	.37
21	.39	.41	51	.59	.37
22	.49	.30	52	.37	.07
23	.48	.15	53	.30	.44
24	.52	0	54	.39	.04
25	.43	.41	55	.44	.15
26	.48	.44	56	.39	.33
27	.31	.26	57	.61	.19
28	.33	.22	58	.65	.41
29	.35	.04	59	.44	.37
30	.46	.26	60	.37	.22

TEST 5

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1	.19	.15	31	.44	.12
2	.37	.19	32	.46	.38
3	.33	.27	33	.37	.04
4	.52	.65	34	.35	.15
5	.44	.42	35	.46	.23
6	.29	-.27	36	.31	.38
7	.42	0	37	.29	-.04
8	.38	.23	38	.19	.08
9	.33	.12	39	.42	.38
10	.65	.38	40	.31	.15
11	.35	-.08	41	.60	.27
12	.23	0	42	.21	.12
13	.56	.12	43	.23	.31
14	.42	.62	44	.56	.50
15	.35	.23	45	.25	.19
16	.50	.31	46	.42	.23
17	.40	.19	47	.40	.04
18	.44	.50	48	.46	.38
19	.46	-.08	49	.54	.31
20	.52	.42	50	.19	.15
21	.38	.31	51	.60	.12
22	.31	-.08	52	.58	.46
23	.21	.12	53	.23	.31
24	.73	.31	54	.23	.08
25	.56	-.19	55	.52	-.04
26	.35	-.15	56	.31	.15
27	.58	.69	57	.15	-.08
28	.35	.08	58	.46	.31
29	.35	0	59	.35	.15
30	.33	.19	60	.33	.12

TEST 6

Item No.	Difficulty	Discrimination
1	.45	.42
2	.80	.04
3	.51	.54
4	.35	.46
5	.45	.19
6	.49	.50
7	.75	.38
8	.61	.73
9	.31	.23
10	.69	.19
11	.52	.35
12	.46	.46
13	.50	.31
14	.31	0
15	.42	.46
16	.42	.54
17	.50	.46
18	.31	.31
19	.40	.27
20	.27	.31
21	.62	.54
22	.38	.31
23	.56	.27
24	.25	.19
25	.23	.23
26	.46	.31
27	.62	.15
28	.62	.62
29	.52	.50
30	.42	.08
31	.59	.46
32	.35	.23
33	.77	.46
34	.50	.31
35	.54	.54
36	.35	.38
37	.46	.31
38	.83	.12
39	.27	.31
40	.73	.38

TEST 6 (concl)

Item No.	Diffi-culty	Discrimi-nation
41	.46	.62
42	.73	.46
43	.71	.35
44	.40	.35
45	.50	.54
46	.77	.31
47	.42	.15

TEST 7

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1	.67	.50	21	.62	.38
2	.54	.31	22	.58	.38
3	.79	.35	23	.38	.62
4	.62	.62	24	.38	.15
5	.33	.27	25	.60	.50
6	.67	.42	26	.52	.27
7	.58	.54	27	.27	.23
8	.40	.19	28	.52	.65
9	.35	-.15	29	.37	.12
10	.58	.15	30	.48	.04
11	.67	.50	31	.25	-.27
12	.38	.62	32	.50	.46
13	.62	.38	33	.69	.54
14	.58	.38	34	.37	.27
15	.56	.35	35	.73	.31
16	.54	.62	36	.27	.23
17	.62	.62	37	.56	.42
18	.27	0	38	.37	.27
19	.44	.65	39	.46	.38
20	.58	.23	40	.25	.12

TEST 7 (concl.)

Item No.	Diffi- culty	Discrimi- nation
41	.52	.50
42	.42	.38
43	.58	.46
44	.50	.54
45	.52	.35
46	.63	.65
47	.46	0
48	.46	.31

TEST 8

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1	.52	.65	21	.63	.65
2	.54	.38	22	.27	.15
3	.77	.31	23	.46	.31
4	.38	.54	24	.38	.46
5	.27	.15	25	.46	.31
6	.54	.31	26	.71	.42
7	.67	.50	27	.63	.35
8	.13	-.04	28	.58	.46
9	.35	.15	29	.67	.50
10	.42	.31	30	.52	.04
11	.50	.46	31	.50	.23
12	.67	.58	32	.33	.19
13	.29	.12	33	.33	.42
14	.46	.69	34	.31	.54
15	.37	.42	35	.50	.46
16	.31	0	36	.42	.15
17	.63	.42	37	.65	.54
18	.42	.38	38	.48	.50
19	.63	.42	39	.48	.50
20	.29	.27	40	.60	.58

TEST 8 (concl.)

Test No.	Diffi-culty	Discrimi-nation
41	.40	.35
42	.31	.38
43	.31	.08
44	.37	.50
45	.33	.27
46	.56	.58
47	.25	.42
48	.46	.15

TEST 9

Item No.	Diffi-culty	Discrimi-nation
1	.60	.73
2	.62	.38
3	.48	.65
4	.38	.38
5	.44	.42
6	.65	.23
7	.31	.31
8	.50	.23
9	.67	.35
10	.33	.35
11	.54	.46
12	.42	.54
13	.52	.35
14	.52	.58
15	.57	.35
16	.55	.15
17	.44	.35
18	.46	.46
19	.69	.46
20	.35	.31

TEST 10

Item No.	Difficulty	Discrimination
1	.50	.44
2	.44	.32
3	.54	.36
4	.42	.28
5	.62	.60
6	.50	.44
7	.48	.32
8	.34	.44
9	.68	.48
10	.59	.20
11	.50	.28
12	.50	.28
13	.38	.28
14	.34	.36
15	.42	.44
16	.40	.08
17	.48	.56
18	.38	.28
19	.46	.36
20	.46	.44

TEST 13

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1	.52	.58	21	.42	.38
2	.52	.19	22	.17	.19
3	.56	.27	23	.29	.19
4	.19	.23	24	.44	.04
5	.33	.27	25	.35	.08
6	.60	.19	26	.35	-.46
7	.54	.31	27	.25	.27
8	.56	.50	28	.73	.08
9	.52	.04	29	.79	.19
10	.52	.42	30	.44	.58
11	.63	.35	31	.63	.19
12	.60	.27	32	.21	.27
13	.79	.04	33	.25	.04
14	.40	.42	34	.56	.19
15	.79	.27	35	.13	.12
16	.77	.31	36	.35	0
17	.33	.27	37	.50	.46
18	.46	.46	38	.35	.38
19	.17	.27	39	.46	.15
20	.13	-.04	40	.19	-.08

TEST 13 (cont.)

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
41	.46	.31	61	.79	.27
42	.25	.27	62	.54	.46
43	.44	.50	63	.23	0
44	.31	.08	64	.31	.46
45	.48	.19	65	.38	.38
46	.33	.19	66	.15	.23
47	.35	-.08	67	.60	.35
48	.56	.04	68	.21	.35
49	.46	0	69	.37	.19
50	.65	.23	70	.35	.23
51	.37	.12	71	.62	.31
52	.40	.19	72	.25	.35
53	.35	.31	73	.37	.19
54	.21	.19	74	.46	.38
55	.31	.15	75	.35	.23
56	.37	.35	76	.62	.46
57	.42	.31	77	.31	.31
58	.19	.08	78	.21	.19
59	.29	.35	79	.27	.31
60	.62	.31	80	.21	-.35

TEST 13 (cont.)

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
81	.50	.46	101	.83	.04
82	.31	.31	102	.38	.54
83	.63	.27	103	.52	
84	.35	.23	104	.52	-.19
85	.67	.04	105	.19	-.15
86	.56	.50	106	.52	.42
87	.50	.54	107	.35	.15
88	.46	.46	108	.13	.12
89	.38	.31	109	.60	.12
90	.46	.38	110	.52	.19
91	.73	.46	111	.50	.31
92	.40	.42	112	.48	.58
93	.25	.42	113	.31	.31
94	.37	-.04	114	.13	.19
95	.37	.04	115	.54	.62
96	.47	.46	116	.63	.42
97	.52	.12	117	.52	.35
98	.35	.08	118	.44	.50
99	.44	.27	119	.46	.15
100	.42	.38	120	.50	.08

TEST 13 (concl.)

Item No.	Difficulty	Discrimination
121	.50	.38
122	.25	.27
123	.21	.12
124	.37	.04
125	.19	0
126	.21	.12
127	.29	.27
128	.23	.08
129	.31	-.08
130	.40	.58
131	.58	.46
132	.71	.08
133	.48	.27
134	.44	-.12
135	.37	.19
136	.35	.46
137	.35	.23
138	.29	.42
139	.29	-.04
140	.38	.38
141	.48	.58
142	.58	0
143	.21	-.04
144	.19	.08

PROPORTION OF CORRECT RESPONSES BY RESPONSE POSITION

(Mean number of correct responses (all sections combined) divided by the total number of possible correct responses)

TEST 1

Response Position 1	Response Position 2	Response Position 3
.7283	.8245	.7497

TEST 2

Response Position 1	Response Position 2	Response Position 3
.6789	.6954	.7000

TEST 3

Response Position 1	Response Position 2	Response Position 3
.6443	.6467	.5860

TEST 4

Response Position 1	Response Position 2	Response Position 3
.5093	.5015	.4210

TEST 5

Response Position 1	Response Position 2	Response Position 3
.3872	.4571	.3733

PROPORTION OF CORRECT RESPONSES BY PITCH RANGE

(Mean number of correct responses
(all sections combined) divided
by total number of possible
correct responses)

TEST 1

High Range	Medium Range	Low Range
.7492	.8444	.7121

TEST 2

High Range	Medium Range	Low Range
.6948	.7692	.6019

TEST 3

High Range	Medium Range	Low Range
.6529	.6751	.5310

ANALYSES OF POOLED RELIABILITY

Selected Response Category - Aural Stimulus

TESTS	n	n-3	r	z_r	Weighted z_r	Weighted Square
1	99	96	.8545	1.275	122.400	156.060000
2	99	96	.9077	1.514	145.344	220.050816
3	100	97	.9059	1.504	145.888	219.415552
4	99	96	.6640	.800	76.800	61.440000
5	98	95	.4338	.464	44.080	20.453120
13	96	93	.9059	1.504	139.872	210.367488
		573			674.384	887.786976

Average z_r = 1.1769 $x^2 = 94.104446$ $p < .001$

Average r = .827   df = 5

Excluding tests 4 and 5

Average z_r = 1.44896 $x^2 = 3.888700$ $.20 < p < .30$

Average r = .896   df = 3

Analysis of Pooled Reliability

Selected Response Category - Visual Stimulus

TESTS	n	n-3	r	z_r	Weighted z_r	Weighted Square
6	97	94	.8045	1.112	104.528	116.235136
7	97	94	.8124	1.134	106.596	120.879864
8	94	91	.8221	1.163	105.833	123.083779
9	96	93	.6311	.743	69.099	51.340557
10	93	90	.6121	.712	64.080	45.624960
		462			450.136	457.164296

Average z_r = .9743 x^2 = 18.596791 $p < .001$

Average r = .751 df = 4

Excluding tests 9 and 10 x^2 = .135627 $.90 < p < .95$

Average z_r = 1.136 df = 2

Average r = .813

Analysis of Pooled Reliability
Constructed Response Category - Written

TESTS	n	n-3	r	z_r	Weighted z_r	Weighted Square
11	96	93	.906	1.504	139.872	210.367488
12	94	91	.843	1.231	112.021	137.897851
		184			251.893	348.265339

Average $z_r = 1.369$ $x^2 = 3.423822$ $.05 < p < .10$

Average $r = .878$ $df = 1$

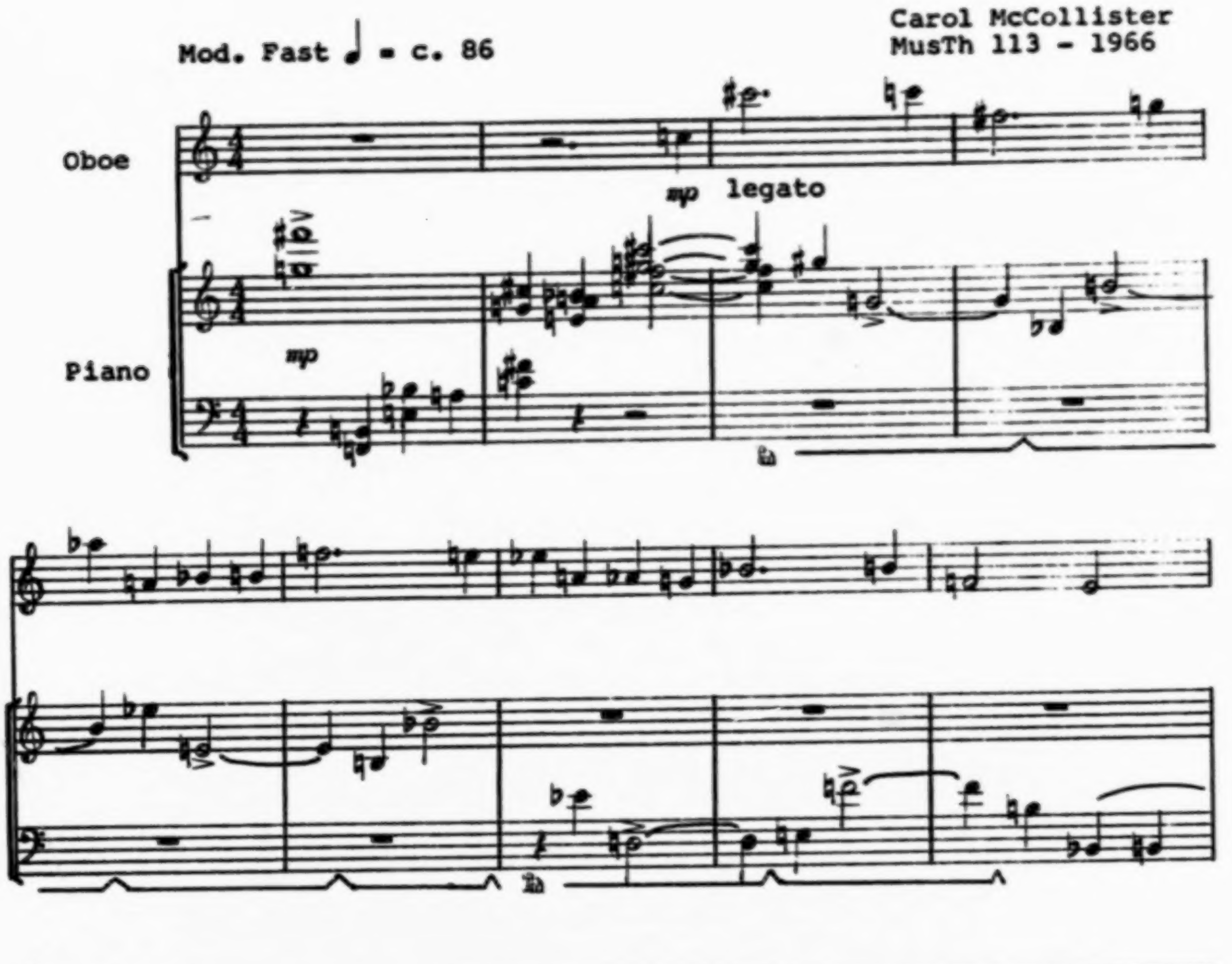
Analysis of Pooled Reliability
All Response Categories

RESPONSE CATEGORY	n-3	r	z_r	Weighted z_r	Weighted Square
Selected-Aural	382	.896	1.452	554.664	805.372128
Selected-Visual	279	.813	1.135	316.665	359.414775
Constructed-Written	184	.878	1.369	251.893	348.265339
Constructed-Vocal	93	.895	1.446	134.478	194.455188
	938			1257.700	1707.507430

Average $z_r = 1.341$ $x^2 = 20.931730$ $p < .001$

Average $r = .872$ $df = 3$

Carol McCollister
MusTh 113 - 1966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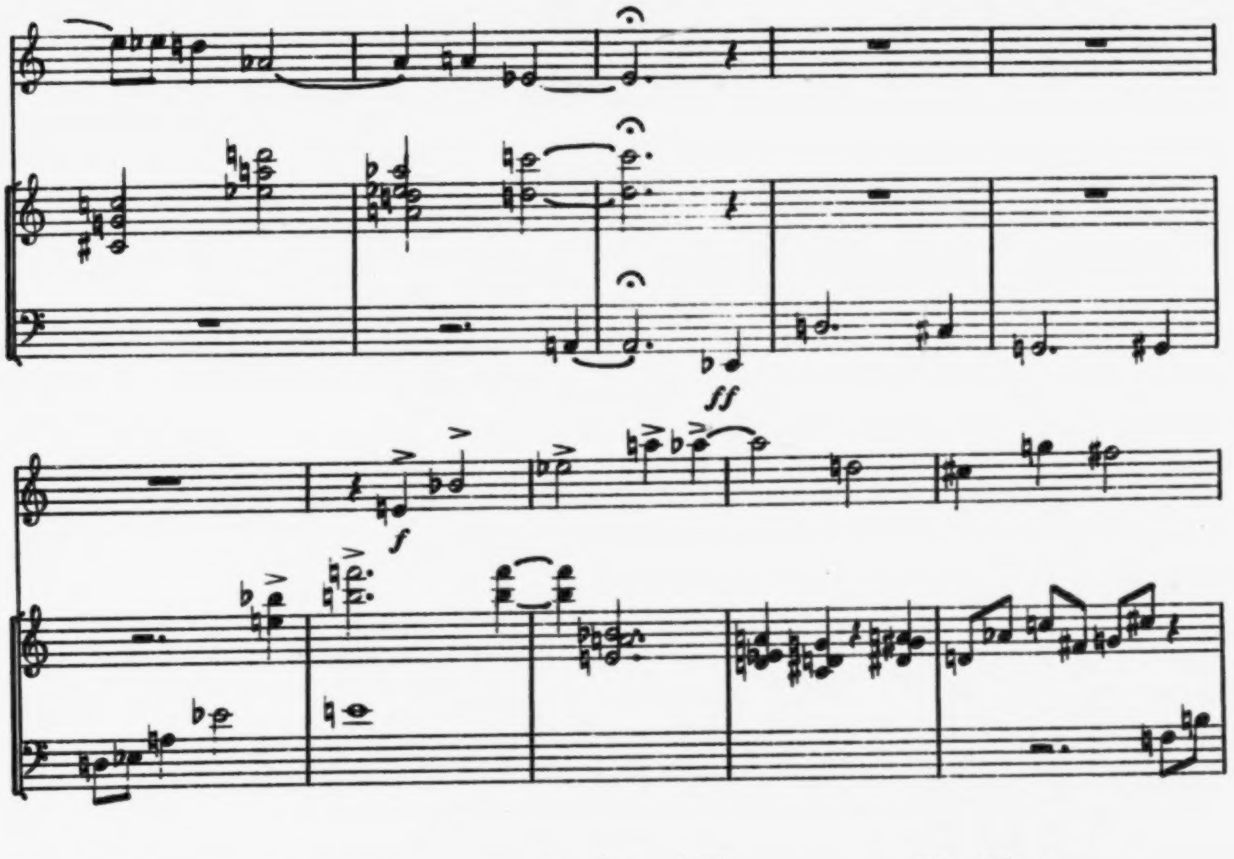
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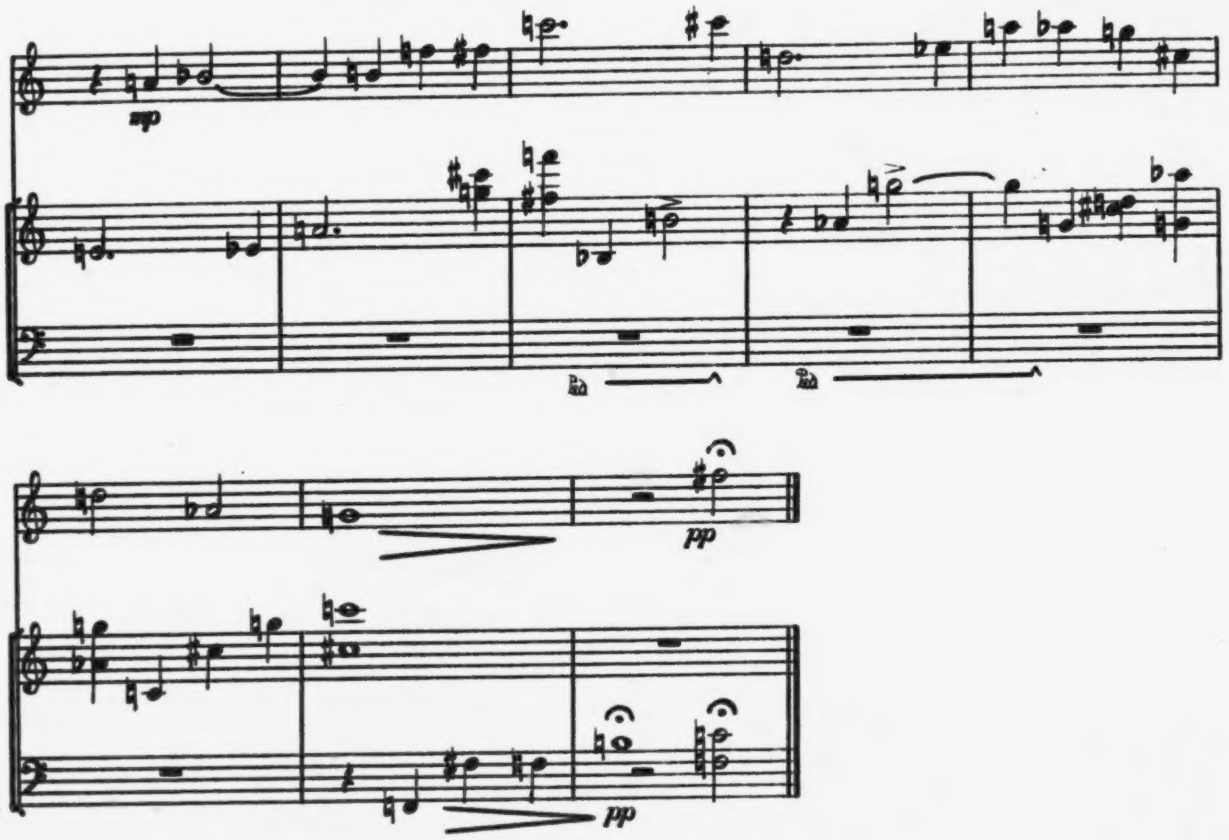
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ATTITUDE INVENTORY

Name________________________________ Course ______ Sec ____ Date ___________

Grade (circle one) Fresh. Soph. Junior Senior Grad.

Age _________ Sex (circle one) M F

College Major _______________________ College Minor __________________

If undeclared, intended major ____________________

If undeclared, intended minor ____________________

Procedure:

The scales on the following pages are designed to provide you with an opportunity to express your feeling toward various stimulus words or phrases. Directly beneath each set of words or phrases is a 7-point scale in which you are to record your feelings.

Example

ART (stimulus word)

1. valuable _X_: ____: ____: ____: ____: ____: ____: worthless
2. valuable ____: ____: ____: ____: ____: ____: _X_: worthless
3. valuable ____: _X_: ____: ____: ____: ____: ____: worthless
4. valuable ____: ____: ____: ____: ____: _X_: ____: worthless
5. valuable ____: ____: _X_: ____: ____: ____: ____: worthless
6. valuable ____: ____: ____: ____: _X_: ____: ____: worthless
7. valuable ____: ____: ____: _X_: ____: ____: ____: worthless

a) Mark as in (#1) if you consider Art very valuable.
b) Mark as in (#2) if you consider Art almost completely worthless.
c) Mark as in (#3) if you consider Art quite valuable.
d) Mark as in (#4) if you consider Art quite worthless.
e) Mark as in (#5) if you consider Art of some value.
f) Mark as in (#6) if you consider Art of questionable worth.
g) Mark as in (#7) if you consider Art neither valuable nor worthless.

NOTE: (1) Place your X marks directly on the lines (as in the example) and not in the spaces between the lines.

(2) Never place more than one X on a single line.

(3) Check every scale. Do not omit any.

(4) Since every scale should represent a separate and independent judgement, do not turn back to scales already completed. We want your FIRST IMPRESSIONS ONLY.

THIS IS NOT A TEST ! THERE ARE NO CORRECT OR WRONG ANSWERS ! THE RESULTS OBTAINED WILL IN NO WAY WHATSOEVER AFFECT YOUR GRADES IN ANY OF YOUR COURSES OR JEOPARDIZE YOUR STANDING AT THE UNIVERSITY !

____

(stimulus word or phrase)

1. good ____: ____: ____: ____: ____: ____: ____: bad
2. awful ____: ____: ____: ____: ____: ____: ____: nice
3. interesting ____: ____: ____: ____: ____: ____: ____: meaningful
4. pleasant ____: ____: ____: ____: ____: ____: ____: unpleasant
5. tasteful ____: ____: ____: ____: ____: ____: ____: distasteful
6. dull ____: ____: ____: ____: ____: ____: ____: exciting
7. beautiful ____: ____: ____: ____: ____: ____: ____: ugly
8. empty ____: ____: ____: ____: ____: ____: ____: full
9. fair ____: ____: ____: ____: ____: ____: ____: unfair
10. hazy ____: ____: ____: ____: ____: ____: ____: clear
11. colorless ____: ____: ____: ____: ____: ____: ____: colorful
12. poor ____: ____: ____: ____: ____: ____: ____: rich
13. genuine ____: ____: ____: ____: ____: ____: ____: artificial
14. vague ____: ____: ____: ____: ____: ____: ____: precise
15. negative ____: ____: ____: ____: ____: ____: ____: positive

COMPARATIVE RANK OF SECTIONS BETWEEN PRE-TEST AND POST-TEST

	PRE-TEST SUPERIORITY					POST-TEST SUPERIORITY					POST-TEST CHANGE				
	1st	2nd	3rd	4th	(NV)+	1st	2nd	3rd	4th	(NV)	1st	2nd	3rd	4th	(NV)
TONAL															
Sec. 1	2*	6	5	1	(37)	1	4	4	5	(29)	1	5	5	2	(31)
Sec. 2	8	2	1	3	(43)	12	1	1	0	(53)	6	2	4	2	(40)
Sec. 3	2	4	3	5	(31)	0	2	4	8	(22)	5	1	2	6	(33)
Sec. 4	2	4	4	3	(31)	1	8	5	0	(38)	2	5	3	4	(33)
ATONAL															
Sec. 1	1	5	4	4	(31)	0	4	6	4	(28)	2	7	4	1	(38)
Sec. 2	7	1	4	2	(41)	12	1	1	0	(53)	8	1	2	3	(44)
Sec. 3	4	3	1	6	(33)	0	0	6	8	(20)	0	2	5	7	(23)
Sec. 4	3	5	5	1	(38)	2	9	2	1	(36)	4	4	3	3	(37)
TOTAL															
Sec. 1	1	7	2	4	(35)	1	4	4	5	(29)	2	7	4	1	(38)
Sec. 2	7	3	0	4	(41)	12	1	1	0	(53)	8	0	2	4	(40)
Sec. 3	3	1	8	2	(33)	0	0	5	9	(19)	1	3	3	7	(26)
Sec. 4	3	3	5	3	(34)	1	9	4	0	(39)	3	4	5	2	(36)

*Indicates the number of tests from the total of 14 in which the section was ranked first, etc.

+Numerical value achieved by assigning the value of 4 to first place, 3 to second place, 2 to third place, and 1 to fourth place.

ANALYSES OF COVARIANCE

Test # 1 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	713.50	443.12	77.65	3	25.88
Within	65	4575.58	4243.75	2441.98	64	38.16
Total	68	5289.08	4686.87	2519.63	67	

F = .6783

df = 3/64 Probability = .5684

Test # 1 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	389.53	561.12	102.44	3	34.14
Within	65	3389.55	3835.17	2256.41	64	35.25
Total	68	3779.08	4396.29	2358.85	67	

F = .9685

df = 3/64 Probability = .4131

Test # 1 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	2150.67	1911.29	152.50	3	50.83
Within	65	14269.33	14607.27	6816.70	64	106.51
Total	68	16420.00	16518.56	6969.20	67	

F = .4772

df = 3/64 Probability = .6992

Test # 2 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	646.68	408.73	57.25	3	19.08
Within	65	5723.96	4689.91	3105.99	64	48.53
Total	68	6370.64	5098.64	3163.24	67	

F = .3932

df = 3/64 Probability = .7582

Test # 2 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	495.86	777.35	307.61	3	102.54
Within	65	4425.30	3658.39	2853.05	64	44.58
Total	68	4921.16	4435.74	3160.66	67	

F = 2.300

df = 3/64 Probability = .0856

Test # 2 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	2180.33	2255.16	541.41	3	180.47
Within	65	18314.83	15105.05	10236.67	64	159.95
Total	68	20495.16	17360.21	10778.08	67	

F = 1.1283

df = 3/64 Probability = .3443

Test # 3 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	680.20	390.06	60.45	3	20.15
Within	66	4411.65	4492.93	1823.33	65	28.05
Total	69	5091.85	4882.99	1883.78	68	

F = .7182

df = 3/65 Probability = .5446

Test # 3 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	387.10	254.82	43.77	3	14.59
Within	66	4577.25	3598.33	2240.41	65	34.47
Total	69	4964.35	3853.15	2284.18	68	

F = .4233

df = 3/65 Probability = .7368

Test # 3 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	2080.30	1310.64	98.66	3	32.89
Within	66	16475.78	14866.64	6497.19	65	99.96
Total	69	18556.08	16177.28	6595.85	68	

F = .3290

df = 3/65 Probability = .8043

Test # 4 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	52.96	24.46	6.08	3	2.03
Within	66	1084.13	1203.88	1036.20	65	15.94
Total	69	1137.09	1228.34	1042.28	68	

F = .1270

df = 3/65 Probability = .9437

Test # 4 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	72.79	38.48	25.58	3	8.53
Within	66	717.56	696.50	675.47	65	10.39
Total	69	790.35	734.98	701.05	68	

F = .8204

df = 3/65 Probability = .4872

Test # 4 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	229.41	105.10	22.95	3	7.65
Within	66	2814.08	3038.68	2546.85	65	39.18
Total	69	3043.49	3143.78	2569.80	68	

F = .1952

df = 3/65 Probability = .8992

Test # 5 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	48.83	31.26	26.55	3	8.85
Within	64	548.11	647.51	583.10	63	9.26
Total	67	596.94	678.77	609.65	66	

F = .9562

df = 3/63 Probability = .4190

Test # 5 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	47.44	25.11	14.92	3	4.97
Within	64	517.09	710.70	678.51	63	10.77
Total	67	564.53	735.81	693.43	66	

F = .4616

df = 3/63 Probability = .7100

Test # 5 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	166.04	101.13	46.14	3	15.38
Within	64	1216.02	2099.38	1854.32	63	29.43
Total	67	1382.06	2200.51	1900.46	66	

F = .5224

df = 3/63 Probability = .6683

Test # 6 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	11.54	6.51	23.42	3	7.81
Within	65	1236.40	1266.04	408.27	64	6.38
Total	68	1247.94	1272.55	431.69	67	

F = 1.2235

df = 3/64 Probability = .3084

Test # 6 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	6.66	8.69	17.46	3	5.82
Within	65	978.55	1363.74	802.29	64	12.54
Total	68	985.21	1372.43	819.75	67	

F = .4641

df = 3/64 Probability = .7082

Test # 6 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	27.51	19.92	59.67	3	19.89
Within	65	3777.74	4696.89	1636.56	64	25.57
Total	68	3805.25	4716.81	1696.23	67	

F = .7778

df = 3/64 Probability = .5106

Test # 7 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	1.06	10.14	9.69	3	2.90
Within	65	1299.92	1217.80	618.62	64	9.67
Total	68	1300.98	1227.94	627.31	67	

F = .2998

df = 3/64 Probability = .8253

Test # 7 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	25.42	38.61	44.08	3	14.69
Within	65	1155.88	1282.55	619.53	64	9.68
Total	68	1181.30	1321.16	663.61	67	

F = 1.5178

df = 3/64 Probability = .2183

Test # 7 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	28.21	84.88	89.65	3	29.88
Within	65	4277.56	4235.41	1585.84	64	24.78
Total	68	4305.77	4320.29	1675.49	67	

F = 1.2060

df = 3/64 Probability = .3147

Test # 8 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	29.11	42.70	44.76	3	14.92
Within	64	1213.89	1105.58	669.49	63	10.63
Total	67	1243.00	1148.28	714.25	66	

F = 1.4041

df = 3/63 Probability = .2498

Test # 8 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	34.43	60.13	36.16	3	12.05
Within	64	1153.38	914.74	537.77	63	8.54
Total	67	1187.81	974.87	573.93	66	

F = 1.4120

df = 3/63 Probability = .2475

Test # 8 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	67.33	199.11	150.97	3	50.32
Within	64	4090.48	3410.42	1608.90	63	25.54
Total	67	4157.81	3609.53	1759.87	66	

F = 1.9705

df = 3/63 Probability = .1274

Test # 9 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	3.01	8.10	4.33	3	1.44
Within	64	267.93	320.76	206.82	63	3.28
Total	67	270.94	328.86	211.15	66	

F = .4395

df = 3/63 Probability = .7255

Test #9 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	1.23	6.06	5.26	3	1.75
Within	64	206.72	270.69	239.55	63	3.80
Total	67	207.95	276.75	244.81	66	

F = .4607

df = 3/63 Probability = .7106

Test #9 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	6.38	18.63	11.42	3	3.81
Within	64	668.38	855.49	546.13	63	8.67
Total	67	674.76	874.12	557.55	66	

F = .4390

df = 3/63 Probability = .7258

Test # 10 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	23.25	11.66	1.96	3	.65
Within	64	247.99	330.03	263.25	63	4.18
Total	67	271.24	341.69	265.21	66	

F = .1561

df = 3/63 Probability = .9253

Test # 10 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	3.02	8.02	6.31	3	2.10
Within	64	167.92	271.67	257.52	63	4.09
Total	67	170.94	279.69	263.83	66	

F = .5147

df = 3/63 Probability = .6735

Test # 10 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	37.25	22.52	2.99	3	[illegible]
Within	64	563.99	918.48	769.82	63	12.22
Total	67	601.24	941.00	772.81	66	

F = .0815

df = 3/63 Probability = .9698

Test # 11 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	17.10	100.22	168.44	3	56.15
Within	65	1926.21	2109.73	949.83	64	14.84
Total	68	1943.31	2209.95	1118.27	67	

F = 3.7832

df = 3/64 Probability = .0145

Test # 11 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	35.91	79.53	86.20	3	28.73
Within	65	1421.05	1655.45	826.67	64	12.92
Total	68	1456.96	1734.98	912.87	67	

F = 2.2245

df = 3/64 Probability = .0938

Test # 11 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	53.39	328.58	427.92	3	142.64
Within	65	6239.22	6948.29	2826.48	64	44.16
Total	68	6292.61	7276.87	3254.40	67	

F = 3.2298

df = 3/64 Probability = .0280

Test # 12 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	3.59	49.66	47.41	3	15.80
Within	64	1818.68	2930.15	1287.29	63	20.43
Total	67	1822.27	2979.81	1334.70	66	

F = .7734

df = 3/63 Probability = .5131

Test # 12 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	10.10	48.27	94.36	3	31.45
Within	64	1431.59	1838.71	701.50	63	11.13
Total	67	1441.69	1886.98	795.86	66	

F = 2.8246

df = 3/63 Probability = .0457

Test # 12 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	18.20	170.07	275.71	3	91.90
Within	64	5718.86	8853.99	2579.46	63	40.94
Total	67	5737.06	9024.06	2855.17	66	

F = 2.2446

df = 3/63 Probability = .0917

Test # 13 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	408.82	248.12	252.86	3	84.29
Within	67	6501.15	5764.75	3038.56	66	46.04
Total	70	6909.97	6012.87	3291.42	69	

F = 1.83

df = 3/66 Probability = .1501

Test # 13 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	16.24	58.20	28.82	3	9.61
Within	67	3959.96	4177.10	2757.70	66	41.78
Total	70	3976.20	4235.30	2786.52	69	

F = .2299

df = 3/66 Probability = .8752

Test # 13 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	465.50	543.99	351.56	3	117.19
Within	67	18653.12	17801.11	8855.68	66	134.18
Total	70	19118.62	18345.10	9207.24	69	

F = .8733

df = 3/66 Probability = .4594

Test # 14 Tonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	40.82	114.57	50.40	3	16.80
Within	64	1564.95	2246.65	1103.51	63	17.52
Total	67	1605.77	2361.22	1153.91	66	

$F = .9592$

df = 3/63 Probability = .4176

Test # 14 Atonal

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	2.51	174.72	152.21	3	50.74
Within	64	1018.73	1526.22	662.15	63	10.51
Total	67	1021.24	1700.94	814.36	66	

$F = 4.8272$

df = 3/63 Probability = .0043

Test # 14 Total

Sources	df	ss_x	ss_y	ss'_y	df	ms'_y
Among	3	61.50	555.34	323.37	3	107.79
Within	64	4709.39	6554.47	2435.48	63	38.66
Total	67	4770.89	7109.81	2758.85	66	

$F = 2.7882$

df = 3/63 Probability = .0477

Simple Analysis of Variance

```
TEST 1

Pre-test Tonal:    F=3.265   df=3/95   Probability=.0247

Means: 1)  50.56   2)  56.32   3)  50.56   4)  50.08

Pre-test Atonal:   F=3.140   df=3/95   Probability=.0289

Means: 1)  49.48   2)  54.76   3)  49.96   4)  50.33

Pre-test Total:    F=3.538   df=3/95   Probability=.0176

Means: 1) 100.04   2) 111.08   3) 100.52   4) 100.42

Post-test Tonal:   F=2.262   df=3/65   Probability=.0894

Means: 1)  51.42   2)  58.28   3)  55.63   4)  55.13

Post-test Atonal:  F=3.170   df=3/65   Probability=.0300

Means: 1)  51.89   2)  59.33   3)  53.56   4)  55.69

Post-test Total:   F=2.835   df=3/65   Probability=.0449

Means: 1) 103.32   2) 117.61   3) 109.19   4) 110.81

Change Tonal:      F=.7366   df=3/65   Probability=.5339

Means: 1)   2.58   2)   1.33   3)   4.63   4)   3.81

Change Atonal:     F=.2191   df=3/65   Probability=.8827

Means: 1)   3.47   2)   4.44   3)   3.50   4)   4.94

Change Total:      F=.3001   df=3/65   Probability=.8251

Means: 1)   6.21   2)   5.77   3)   8.13   4)   8.75
```

TEST 2

Pre-test Tonal: F=3.064 df=3/95 Probability=.0317

Means: 1) 46.20 2) 50.92 3) 44.80 4) 43.68

Pre-test Atonal: F=2.815 df=3/95 Probability=.0433

Means: 1) 44.12 2) 49.04 3) 43.36 4) 44.04

Pre-test Total: F=3.147 df=3/95 Probability=.0286

Means: 1) 90.32 2) 99.96 3) 88.16 4) 87.72

Post-test Tonal: F=1.888 df=3/65 Probability=.1402

Means: 1) 48.89 2) 54.82 3) 49.13 4) 49.65

Post-test Atonal: F=4.604 df=3/65 Probability=.0055

Means: 1) 45.89 2) 54.12 3) 45.94 4) 49.35

Difference between means	t-value	Probability
Mean 1 - Mean 2	-3.283	.0016
Mean 1 - Mean 3	-1.680	.9866
Mean 1 - Mean 4	-1.380	.1720
Mean 2 - Mean 3	3.130	.0026
Mean 2 - Mean 4	1.852	.0686
Mean 3 - Mean 4	-1.307	.1958

Post-test Total: F=3.247 df=3/65 Probability=.0278

Means: 1) 94.79 2) 108.94 3) 95.06 4) 99.00

Change Tonal: F=.2700 df=3/65 Probability=.8467

Means: 1) 4.84 2) 3.18 3) 3.38 4) 5.24

TEST 2

Change Atonal: F=.1958 df=3/65 Probability=.8988

Means: 1) 3.37 2) 4.88 3) 3.13 4) 4.59

Change Total: F=.1361 df=3/65 Probability=.9381

Means: 1) 8.21 2) 8.06 3) 6.50 4) 9.82

TEST 3

Pre-test Tonal: F=3.419 df=3.96 Probability=.0204
Means: 1) 37.92 2) 42.28 3) 34.56 4) 38.64

Pre-test Atonal: F=1.338 df=3/96 Probability=.2665
Means: 1) 39.56 2) 42.52 3) 37.80 4) 38.96

Pre-test Total: F=2.382 df=3/96 Probability=.0742
Means: 1) 77.48 2) 84.80 3) 72.36 4) 77.60

Post-test Tonal: F=1.901 df=3/66 Probability=.1365
Means: 1) 41.79 2) 47.89 3) 42.88 4) 43.47

Post-test Atonal: F=1.558 df=3/66 Probability=.2079
Means: 1) 44.53 2) 48.78 3) 44.00 4) 44.82

Post-test Total: F=1.939 df=3/66 Probability=.1317
Means: 1) 86.32 2) 96.67 3) 86.25 4) 88.29

Change Tonal: F=1.273 df=3/66 Probability=.2907
Means: 1) 5.00 2) 4.11 3) 7.06 4) 3.53

Change Atonal: F= .320 df=3/66 Probability=.8108
Means: 1) 6.42 2) 4.89 3) 5.69 4) 4.29

Change Total: F= .728 df=3/66 Probability=.5391
Means: 1) 11.42 2) 9.00 3) 12.75 4) 7.82

TEST 4

Pre-test Tonal: F=2.675 df=3/95 Probability=.0515
Means: 1) 14.64 2) 15.48 3) 12.58 4) 13.36

Pre-test Atonal: F=2.2914 df=3/95 Probability=.0831
Means: 1) 13.04 2) 14.52 3) 12.04 4) 13.64

Pre-test Total: F=2.981 df=3/95 Probability=.0352
Means: 1) 27.68 2) 30.00 3) 24.63 4) 27.00

Post-test Tonal: F= .447 df=3/66 Probability=.7201
Means: 1) 16.21 2) 17.17 3) 15.63 4) 15.82

Post-test Atonal: F=1.216 df=3/66 Probability=.3110
Means: 1) 13.05 2) 13.67 3) 11.69 4) 13.41

Post-test Total: F= .7609 df=3/66 Probability=.5200
Means: 1) 29.26 2) 30.83 3) 27.31 4) 29.24

Change Tonal: F= .1564 df=3/66 Probability=.9251
Means: 1) 1.94 2) 1.61 3) 2.56 4) 1.59

Change Atonal: F= .5540 df=3/66 Probability=.6472
Means: 1) .210 2) -1.50 3) -1.06 4) -.88

Change Total: F= .2766 df=3/66 Probability=.8420
Means: 1) 2.16 2) .111 3) 1.50 4) .71

TEST 5

Pre-test Tonal: F=1.082 df=3/93 Probability=.3608

Means: 1) 11.72 2) 11.92 3) 10.78 4) 10.58

Pre-test Atonal: F= .7334 df=3/93 Probability=.5346

Means: 1) 11.40 2) 12.48 3) 11.87 4) 11.50

Pre-test Total: F=1.064 df=3/93 Probability=.3683

Means: 1) 23.12 2) 24.40 3) 22.65 4) 22.08

Post-test Tonal: F=1.0297 df=3/64 Probability=.3854

Means: 1) 11.58 2) 13.39 3) 12.60 4) 12.75

Post-test Atonal: F= .7537 df=3/64 Probability=.5242

Means: 1) 11.05 2) 12.33 3) 11.00 4) 12.13

Post-test Total: F=1.028 df=3/64 Probability=.3863

Means: 1) 22.63 2) 25.72 3) 23.60 4) 24.88

Change Tonal: F=1.292 df=3/64 Probability=.2848

Means: 1) .052 2) .722 3) 2.33 4) 1.56

Change Atonal: F= .466 df=3/64 Probability=.7066

Means: 1) -.315 2) -1.17 3) -.866 4) .312

Change Total: F=.6813 df=3/64 Probability=.5666

Means: 1) -.263 2) -.444 3) 1.466 4) 1.875

TEST 6

Pre-test Tonal: F=.1944 df=3/93 Probability=.8999
Means: 1) 11.28 2) 11.52 3) 12.17 4) 11.46

Pre-test Atonal: F=.4278 df=3/93 Probability=.7334
Means: 1) 10.96 2) 10.44 3) 11.61 4) 10.83

Pre-test Total: F=.3059 df=3/93 Probability=.8210
Means: 1) 22.24 2) 21.96 3) 23.78 4) 22.29

Post-test Tonal: F=.1113 df=3/65 Probability=.9531
Means: 1) 15.32 2) 15.50 3) 14.69 4) 15.00

Post-test Atonal: F=.1380 df=3/65 Probability=.9368
Means: 1) 14.16 2) 15.11 3) 14.50 4) 14.69

Post-test Total: F=.0918 df=3/65 Probability=.9642
Means: 1) 29.47 2) 30.61 3) 29.19 4) 29.69

Change Tonal: F=1.417 df=3/65 Probability=.2458
Means: 1) 3.58 2) 3.11 3) 1.94 4) 2.31

Change Atonal: F=.5536 df=3/65 Probability=.6474
Means: 1) 2.79 2) 4.06 3) 2.63 4) 3.00

Change Total: F=.8693 df=3/65 Probability=.4615
Means: 1) 6.37 2) 7.17 3) 4.56 4) 5.31

TEST 7

Pre-test Tonal: F=.0862 df=3/93 Probability=.9674

Means: 1) 11.00 2) 11.24 3) 11.00 4) 10.63

Pre-test Atonal: F=.3638 df=3/93 Probability=.7792

Means: 1) 11.20 2) 11.76 3) 12.35 4) 11.92

Pre-test Total F=.1110 df=3/93 Probability=.9534

Means: 1) 22.20 2) 23.00 3) 23.35 4) 22.54

Post-test Tonal: F=.1804 df=3/65 Probability=.9092

Means: 1) 14.32 2) 14.94 3) 13.88 4) 14.25

Post-test Atonal: F=.6522 df=3/65 Probability=.5844

Means: 1) 14.00 2) 15.77 3) 14.00 4) 14.31

Post-test Total: F=.4342 df=3/65 Probability=.7292

Means: 1) 28.32 2) 30.72 3) 27.88 4) 28.56

Change Tonal: F=.2404 df=3/65 Probability=.8678

Means: 1) 2.684 2) 3.11 3) 2.13 4) 2.75

Change Atonal: F=1.645 df=3/65 Probability=.1876

Means: 1) 2.68 2) 3.39 3) 1.13 4) 1.69

Change Total: F=1.181 df=3/65 Probability=.3239

Means: 1) 5.37 2) 6.50 3) 3.25 4) 4.44

TEST 8

Pre-test Tonal: F=.9774 df=3/91 Probability=.4070
Means: 1) 8.48 2) 7.88 3) 9.36 4) 9.71

Pre-test Atonal: F=.6380 df=3/91 Probability=.5924
Means: 1) 12.36 2) 11.83 3) 11.14 4) 12.67

Pre-test Total: F=.5296 df=3/91 Probability=.6630
Means: 1) 20.84 2) 19.71 3) 20.50 4) 22.38

Post-test Tonal: F=.8239 df=3/64 Probability=.4854
Means: 1) 11.95 2) 13.65 3) 11.75 4) 13.13

Post-test Atonal: F=1.402 df=3/64 Probability=.2502
Means: 1) 14.68 2) 16.35 3) 13.75 4) 15.38

Post-test Total: F=1.245 df=3/64 Probability=.3006
Means: 1) 26.63 2) 30.00 3) 25.50 4) 28.50

Change Tonal: F=1.430 df=3/64 Probability=.2421
Means: 1) 3.37 2) 4.29 3) 1.69 4) 2.94

Change Atonal: F=.9430 df=3/64 Probability=.4251
Means: 1) 2.10 2) 3.59 3) 2.19 4) 1.75

Change Total: F=1.537 df=3/64 Probability=.2133
1) 5.47 2) 7.88 3) 3.88 4) 4.69

TEST 9

Pre-test Tonal: F=.5054 df=3/92 Probability=.6794

Means: 1) 5.48 2) 5.00 3) 4.73 4) 5.08

Pre-test Atonal: F=.8343 df=3/92 Probability=.4783

Means: 1) 4.80 2) 4.88 3) 4.82 4) 4.17

Pre-test Total: F=.4286 df=3/92 Probability=.7329

Means: 1) 10.28 2) 9.88 3) 9.55 4) 9.25

Post-test Tonal: F=.5389 df=3/64 Probability=.6573

Means: 1) 6.78 2) 6.61 3) 5.94 4) 6.81

Post-test Atonal: F=.4772 df=3/64 Probability=.6992

Means: 1) 6.00 2) 6.06 3) 5.50 4) 5.38

Post-test Total: F=.4646 df=3/64 Probability=.7079

Means: 1) 12.78 2) 12.67 3) 11.44 4) 12.19

Change Tonal: F=.3015 df=3/64 Probability=.8241

Means: 1) 1.00 2) 1.17 3) .75 4) 1.38

Change Atonal: F=.3199 df=3/64 Probability=.8108

Means: 1) .83 2) 1.17 3) .50 4) .56

Change Total: F=.3503 df=3/64 Probability=.7889

Means: 1) 1.83 2) 2.33 3) 1.25 4) 1.94

TEST 10

Pre-test Tonal: F=1.431 df=3/90 Probability-2.387

Means: 1) 4.70 2) 5.64 3) 4.64 4) 5.29

Pre-test Atonal: F=.1530 df=3/90 Probability=.9275

Means: 1) 4.09 2) 4.36 3) 4.36 4) 4.33

Pre-test Total: F=.8053 df=3/90 Probability=.4941

Means: 1) 8.78 2) 10.00 3) 9.00 4) 9.63

Post-test Tonal: F=.7539 df=3/64 Probability=.5241

Means: 1) 5.41 2) 6.39 3) 5.38 4) 5.65

Post-test Atonal: F=.6301 df=3/64 Probability=.5982

Means: 1) 4.47 2) 4.72 3) 4.56 4) 5.35

Post-test Total: F=.5230 df=3/64 Probability=.6679

Means: 1) 9.88 2) 11.11 3) 9.94 4) 11.00

Change Tonal: F=.2808 df=3/64 Probability=.8390

Means: 1) .65 2) .33 3) .75 4) .12

Change Atonal: F=.2735 df=3/64 Probability=.8442

Means: 1) .35 2) .11 3) .06 4) .71

Change Total: F=.0680 df=3/64 Probability=.9766

Means: 1) 1.00 2) .44 3) .81 4) .82

TEST 11

Pre-test Tonal: F=.2236 df=3/92 Probability=.8797

Means: 1) 7.64 2) 6.54 3) 7.48 4) 7.17

Pre-test Atonal: F=.3590 df=3/92 Probability=.7827

Means: 1) 5.48 2) 5.38 3) 5.52 4) 6.54

Pre-test Total: F=.1617 df=3/92 Probability=.9218

Means: 1) 13.12 2) 11.92 3) 13.00 4) 13.71

Post-test Tonal: F=1.029 df=3/65 Probability=.3855

Means: 1) 11.11 2) 13.71 3) 10.56 4) 11.18

Post-test Atonal: F=1.041 df=3/65 Probability=.3804

Means: 1) 9.79 2) 10.71 3) 7.75 4) 8.88

Post-test Total: F=1.0246 df=3/65 Probability=.3876

Means: 1) 20.89 2) 24.41 3) 18.31 4) 20.06

Change Tonal: F=4.011 df=3/65 Probability=.0110

Means: 1) 2.42 2) 6.29 3) 2.19 4) 2.65

Change Atonal: F=2.321 df=3/65 Probability=.0833

Means: 1) 3.74 2) 4.24 3) 2.13 4) 1.29

Change Total: F=3.288 df=3/65 Probability=.0261

Means: 1) 6.16 2) 10.53 3) 4.31 4) 3.94

TEST 12

Pre-test Tonal: F=.1378 df=3/90 Probability=.9371

Means: 1) 6.72 2) 7.21 3) 7.32 4) 6.52

Pre-test Atonal F=.0509 df=3/90 Probability=.9847

Means: 1) 5.84 2) 5.92 3) 6.27 4) 6.17

Pre-test Total: F=.0660 df=3/90 Probability=.9777

Means: 1) 12.56 2) 13.13 3) 13.59 4) 12.70

Post-test Tonal: F=.3615 df=3/64 Probability=.7809

Means: 1) 11.42 2) 13.59 3) 11.73 4) 11.82

Post-test Atonal: F=.5600 df=3/64 Probability=.6433

Means: 1) 10.74 2) 11.71 3) 9.47 4) 9.88

Post-test Total: F=.4097 df=3/64 Probability=.7465

Means: 1) 22.16 2) 25.29 3) 21.20 4) 21.71

Change Total: F=.78.40 df=3/64 Probability=.5072

Means: 1) 4.37 2) 6.18 3) 4.20 4) 4.18

Change Atonal: F=3.023 df=3/64 Probability=.0359

Means: 1) 4.11 2) 5.53 3) 2.20 4) 3.00

Change Total: F=2.2273 df=3/64 Probability=.0934

Means: 1) 8.47 2) 11.71 3) 6.40 4) 7.18

TEST 13

Pre-test Tonal: F=1.602 df=3/93 Probability=.1942

Means: 1) 30.29 2) 25.68 3) 29.48 4) 30.60

Pre-test Atonal: F=.1892 df=3/93 Probability=.9034

Means: 1) 28.71 2) 27.68 3) 27.52 4) 28.72

Pre-test Total F=.7949 df=3/93 Probability=.4997

Means: 1) 59.00 2) 53.36 3) 57.00 4) 59.32

Post-test Tonal: F=.9612 df=3/67 Probability=.4162

Means: 1) 32.00 2) 30.17 3) 28.13 4) 33.17

Post-test Atonal: F=.3111 df=3/67 Probability=.8172

Means: 1) 30.68 2) 29.55 3) 28.94 4) 31.28

Post-test Total: F=.6824 df=3/67 Probability=.5658

Means: 1) 62.68 2) 59.72 3) 57.06 4) 64.44

Change Tonal: F=2.3447 df=3/67 Probability=.0807

Means: 1) .89 2) 4.39 3) -2.50 4) 1.33

Change Atonal: F=.1039 df=3/67 Probability=.9574

Means: 1) 1.105 2) .28 3) .37 4) 1.389

Change Total: F=.8607 df=3/67 Probability=.4658

Means: 1) 2.00 2) 4.67 3) -2.13 4) 2.72

TEST 14

Pre-test Tonal: F=.2102 df=3/93 Probability=.8890
Means: 1) 6.16 2) 6.92 3) 6.00 4) 6.63

Pre-test Atonal: F=.0257 df=3/93 Probability=.9943
Means: 1) 4.52 2) 4.32 3) 4.26 4) 4.29

Pre-test Total: F=.0667 df=3/93 Probability=.9774
Means: 1) 10.68 2) 11.24 3) 10.26 4) 10.92

Post-test Tonal: F=1.088 df=3/64 Probability=.3606
Means: 1) 9.18 2) 12.67 3) 10.20 4) 11.11

Post-test Atonal: F=2.4422 df=3/64 Probability=.0722
Means: 1) 6.12 2) 9.78 3) 5.80 4) 8.06

Post-test Total: F=1.8074 df=3/64 Probability=.1547
Means: 1) 15.29 2) 22.44 3) 16.00 4) 19.17

Change Tonal: F=.8580 df=3/64 Probability=.4675
Means: 1) 2.94 2) 5.06 3) 4.20 4) 3.39

Change Atonal: F=4.8060 df=3/64 Probability=.0044
Means: 1) 1.47 2) 5.00 3) 1.33 4) 3.05

TEST 14

Difference between means	t-value	Probability
Mean 1 - Mean 2	-3.229	.0019
Mean 1 - Mean 3	.120	.9049
Mean 1 - Mean 4	-1.450	.1519
Mean 2 - Mean 3	3.245	.0018
Mean 2 - Mean 4	1.805	.0757
Mean 3 - Mean 4	-1.524	.1323

Change Total: F=2.7220 df=3/64 Probability=.0515

Means: 1) 4.411 2) 10.06 3) 5.53 4) 6.44

PROGRESS OF HIGH and LOW ACHIEVERS by RESPONSE CATEGORIES

Selected - Aural

	Means	
Test No.	High	Low
1	6.696	7.527
2	9.235	8.942
3	11.342	9.114
4	1.314	.942
5	-.121	1.228
13	.729	3.235
Mean of Means	4.866	5.165
Ratio of change to total points possible	.00699	.00742

Selected - Visual

	Means	
Test No.	High	Low
6	6.882	4.971
7	5.285	4.617
8	5.228	5.818
9	2.058	1.647
10	1.742	-.272
Mean of Means	4.239	3.356
Ratio of change to total points possible	.02304	.01824

Constructed-Written

	Means	
Test No.	High	Low
11	6.166	6.363
12	8.885	8.090
Mean of Means	7.526	7.226
Ratio of change to total points possible	.07307	.07016

Constructed - Vocal

	Means	
Test No.	High	Low
14	6.687	6.333
Ratio of change to total points possible	.13931	.13194

ATTITUDE COMPARISON
OF
HIGH (H) AND LOW (L) GRADE GROUPS

Stimulus Phrase	Mean (H)	Mean (L)	t	Probability (One-tailed)
1. Tape-Recorded Self Instruction	55.088	51.617	.716	.2381
2. Music Theory	70.941	67.676	.789	.2161
3. Music Composition	73.441	63.823	2.058	.0217
4. Contemporary Art Music	65.794	59.558	1.176	.1217
5. Music Theory Taught by Tape-Recorded Self-Instruction	48.294	47.264	.179	.4288